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of the

CHEST

OFFICIAL PUBLICATION



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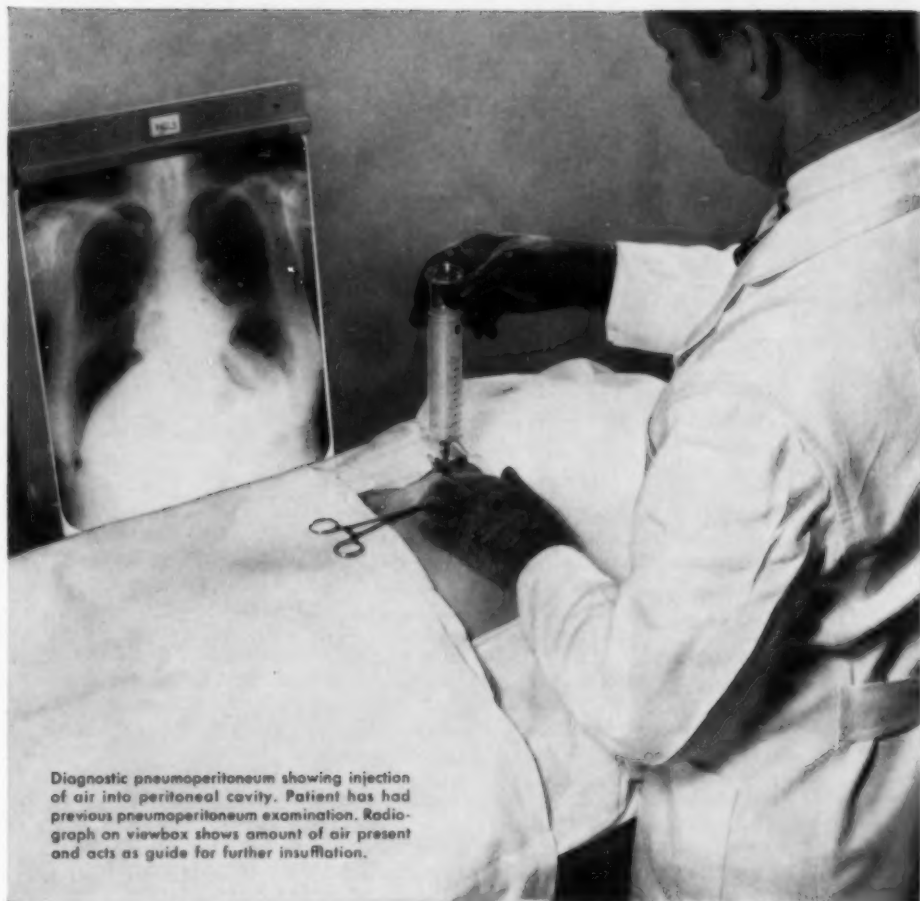
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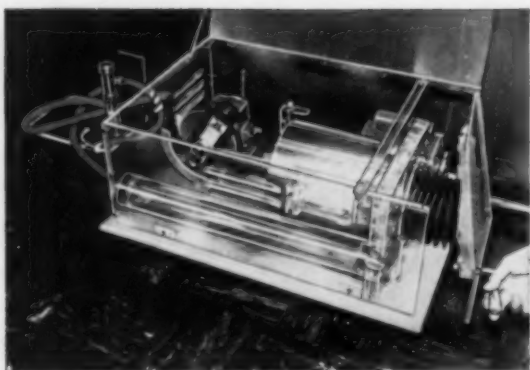
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2. Cohen, R.V., Molthan, L., and Zarafonitis, C.J.D.: *Dis. Chest* 30:418, 1956.

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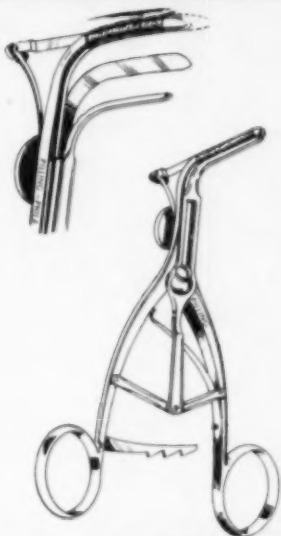
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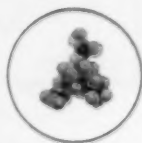


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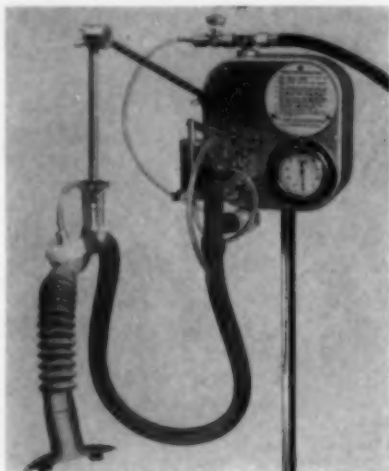
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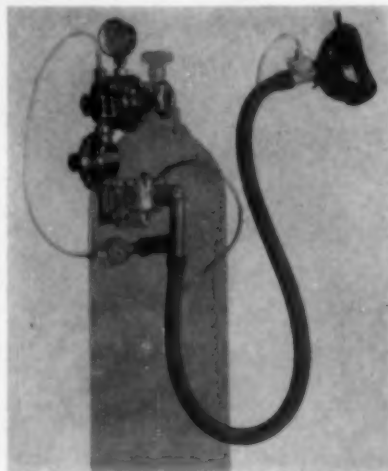
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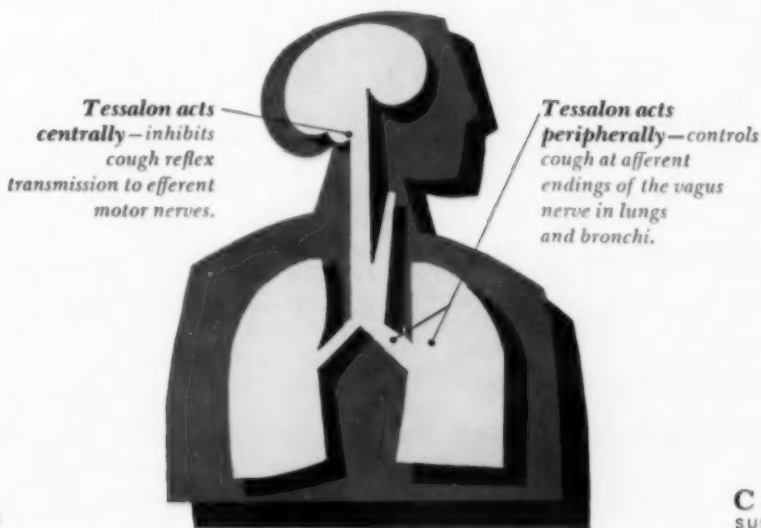
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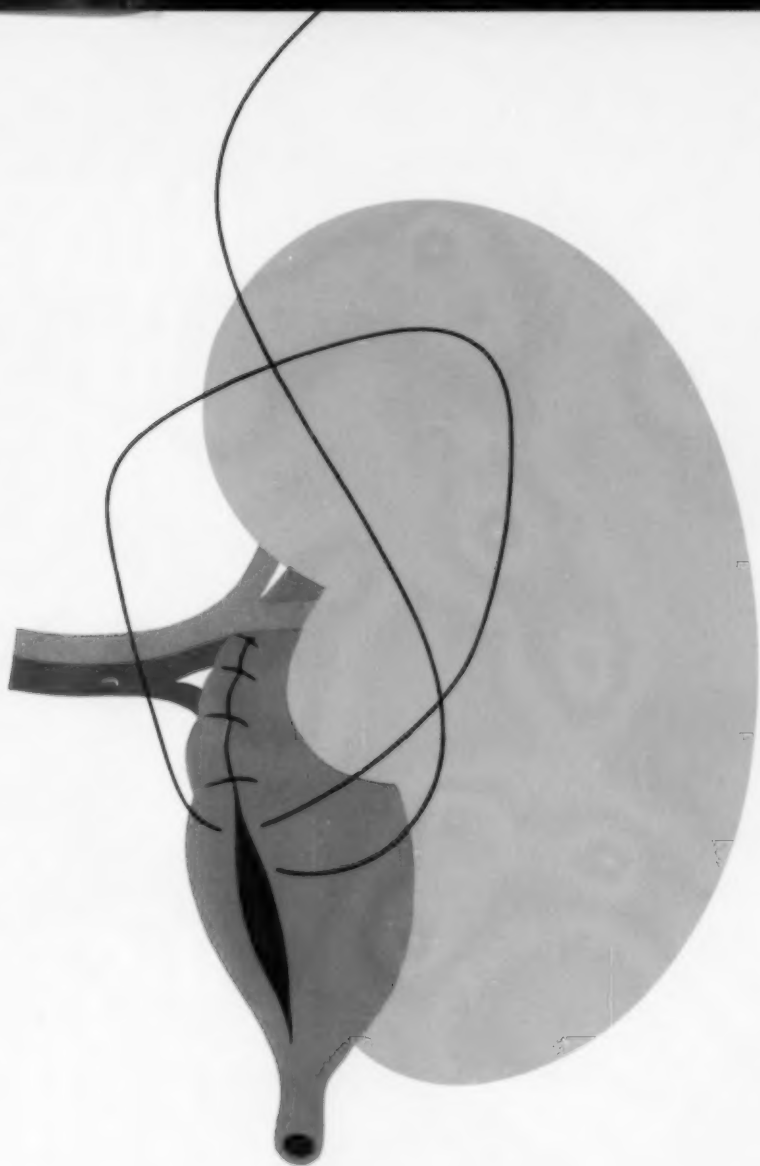
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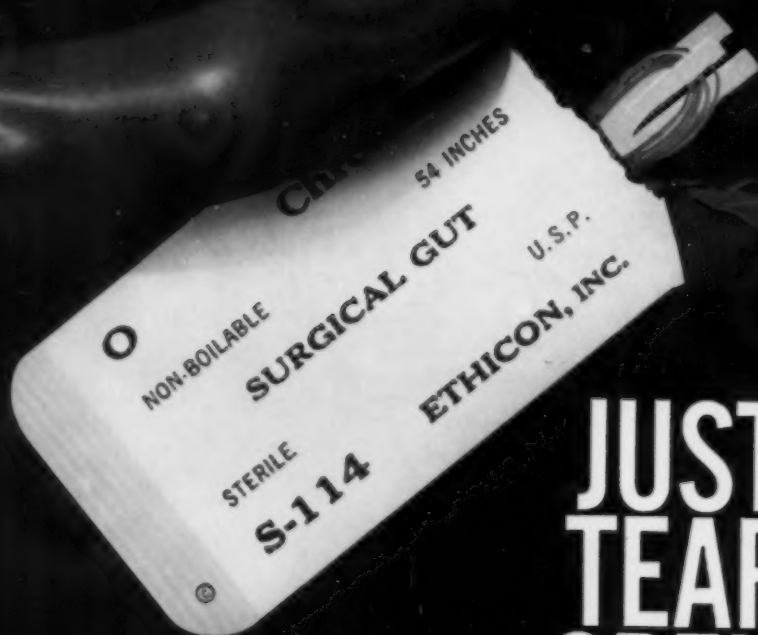


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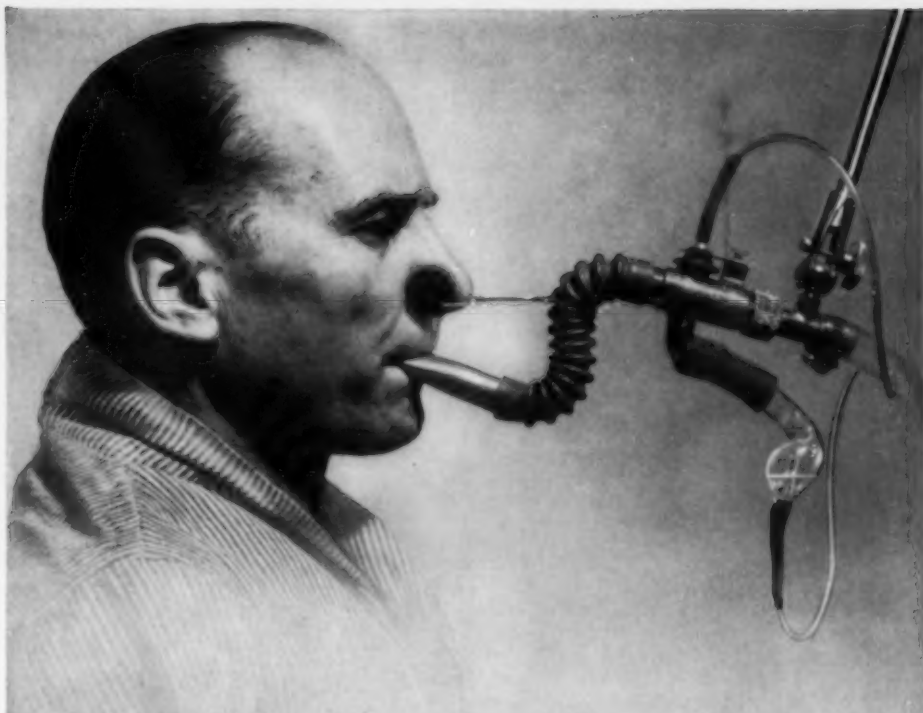
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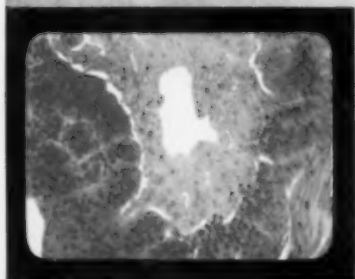


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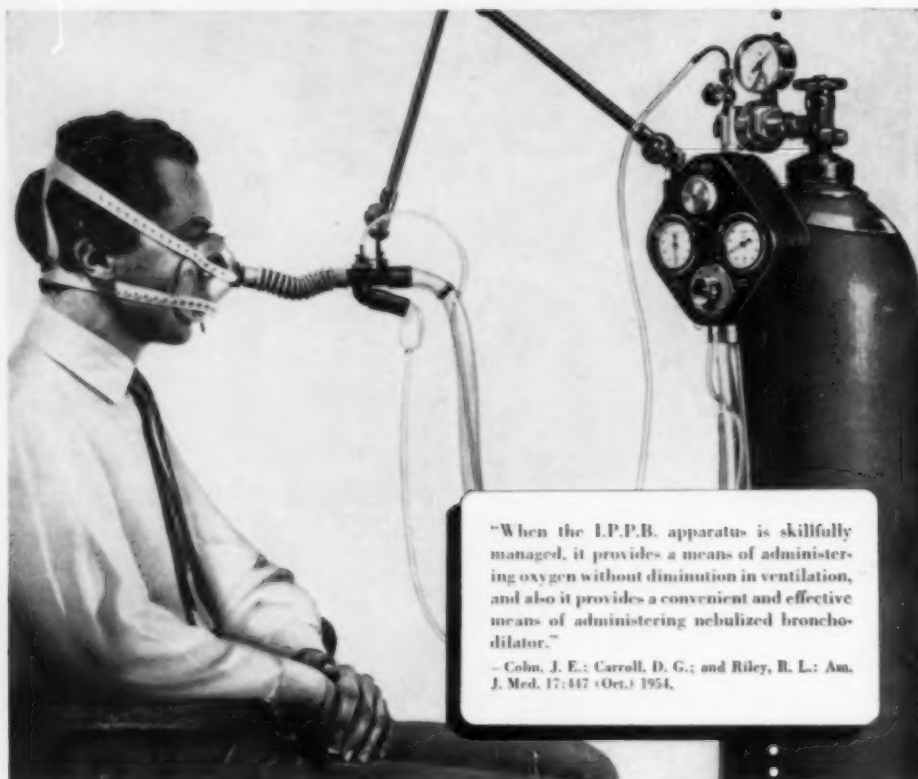
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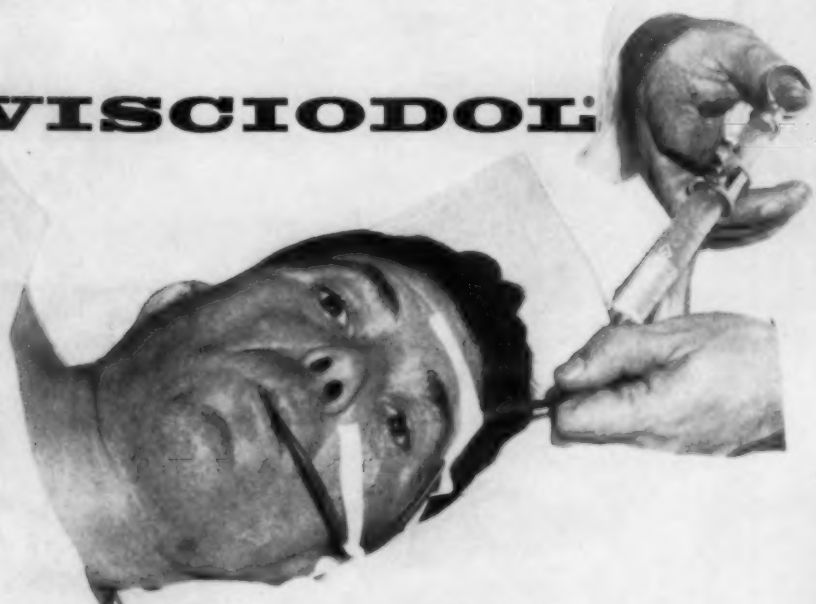
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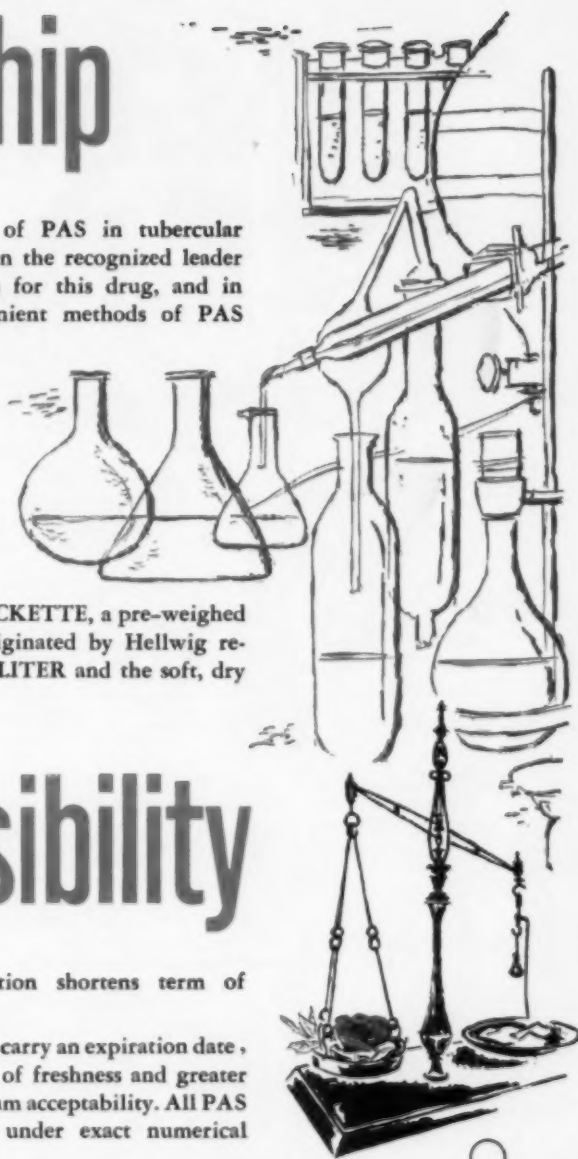
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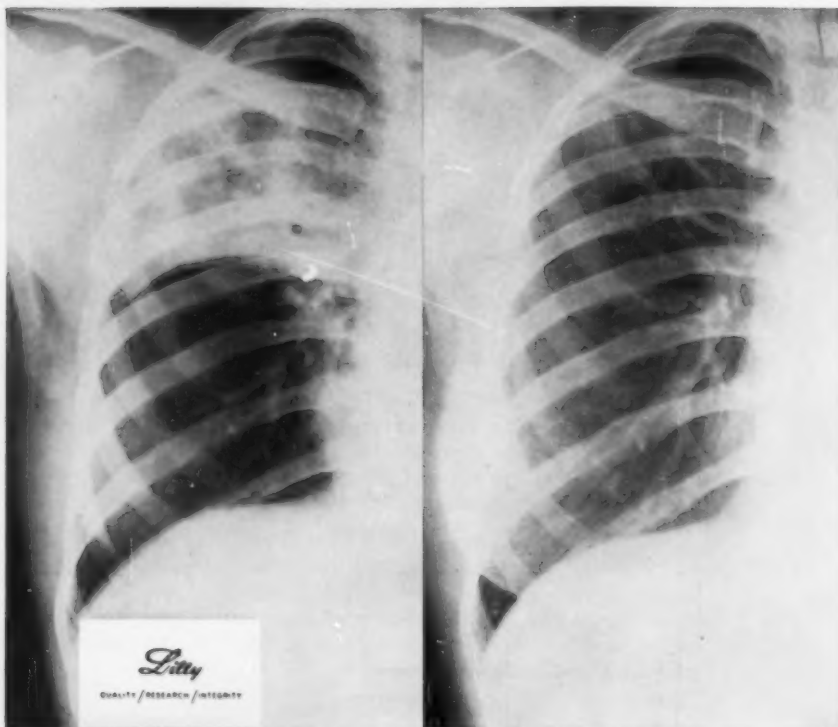
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DISEASES of the CHEST

VOLUME XXXIII

MAY, 1958

NUMBER 5

A Rapid Method for Analysis of Spirographic Tracings in Pulmonary Function Testing

ROSS C. KORY, M.D., F.C.C.P.

Milwaukee, Wisconsin

In recent years, pulmonary function testing has emerged from a primarily research activity carried on in only a few scattered laboratories, to a clinical function of steadily increasing importance in the diagnosis and management of pulmonary disease. This evolution has been in part due to the simplification of techniques and equipment. With increasing clinical employment of these techniques, it is important to simplify and accelerate these measurements. One of the time consuming aspects of such testing is the analysis of spirographic tracings. The methods described in this report are designed to provide more rapid analysis and measurements of spiograms without loss of accuracy.

The most widely used instruments for ventilatory measurements are the nine and 13-½ liter Collins Respirometers, which provide an ink recorded spirographic tracing together with a cumulative record of ventilation by means of a second pen attached to a Reichert ventilograph.¹ Tracings obtained with these instruments can provide the following measurements: resting minute ventilation and oxygen consumption, total vital capacity, timed expiratory volumes, inspiratory and expiratory flow rates, maximum breathing capacity, functional residual capacity by helium dilution, and bronchospirometry. Although the techniques as described are for use with Collins spirometers, they may easily be adapted for use with other instruments.

These techniques are based on a new "slide rule" which by a simple refinement of the Segal-Herschfus ruler² provides more rapid and convenient measurements of spirographic tracings.

Method

The method consists of: (a) A multi-purpose "slide rule" for measurement of the various tracings, and (b) appropriate tables which con-

From the Cardiopulmonary Laboratory and Research Service, Wood Veterans Administration Hospital and the Department of Medicine, Marquette University School of Medicine.

*These slide rules may be obtained from Presco Plastics, Inc., Milwaukee, Wisconsin.

*The spirometer bells for the Collins nine and 13½ liter respirometer are now standardized at 20.73 cc./mm. and 41.27 cc./mm. respectively.

The author is indebted to Jacqueline Owenby, B.S. and Helen Delfeld, B.S. for their useful suggestions in connection with these methods.

vert the slide rule measurements to gas volumes corrected for temperature and barometric pressure.

The "slide rule" as illustrated in Figure 1 consists of a transparent plastic ruler* with four large vertical divisions each 32 mm. wide. This width corresponds to 12 seconds for the rapid kymograph speed of the Collins Respirometer and one minute for the slow kymograph speed of that instrument. The center two divisions have vertical rulings identical with the Segal-Herschfus ruler with 12 equal sub-divisions each representing one second at the rapid kymograph speed. The outer two divisions are ruled horizontally in millimeters, the left scale reading 0 to 150 mm. upward, and the right scale 0 to 150 mm. downward. The horizontal lines across the entire rule at each 50 mm. point are used to orient the ruler properly on the spirographic paper. Finally a slide with a hairline is provided which slips up and down the length of the ruler.

A second longer slide rule (Fig. 2) is available which differs only in that the millimeter scale reads from 0 to 300. This rule is designed primarily for use for measuring vital capacity tracings on the nine liter respirometer or similar spirometers with a small bell.

Two tables are utilized for a given spirometer. The tables shown are for the 13-½ liter Collins spirometer but may just as easily be constructed for the Collins nine liter instrument or any other spirometer. Table I is used for vital capacity and oxygen consumption determinations and includes simply the bell factor (41.27 cc/mm for the 13 ½ liter instrument)* together with the temperature corrections as outlined by Comroe³

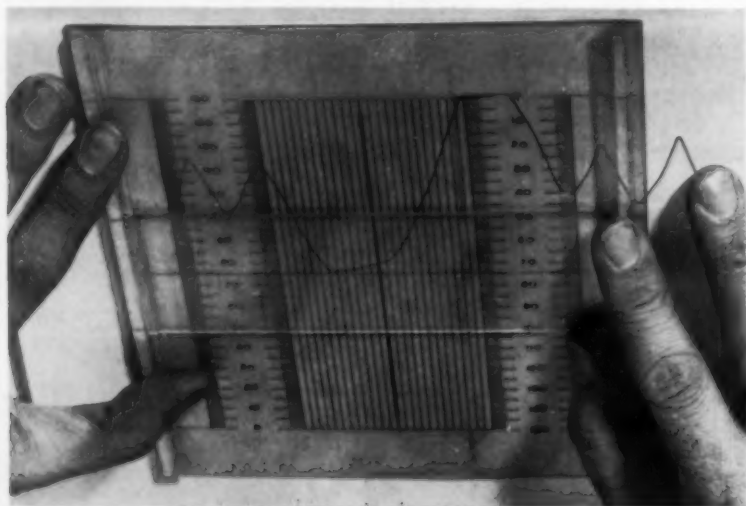


FIGURE 1: The 0-150 mm. pulmonary function slide rule superimposed upon a spirographic tracing. The tracing itself stands out distinctly because of the unlined paper used with this method.

to convert the gas volume to body temperature and pressure, saturated (BTPS). Table II is used in those measurements utilizing the ventilograph pen (resting minute ventilation and maximum breathing capacity) and incorporates: (a) the bell factor, (b) the ventilograph gear factor¹ of the particular instrument, (c) the factor "5" for converting the actual 12 second test to 60 seconds, thereby expressing the maximum breathing capacity in liters per minute, and (d) the temperature correction factor.³

Use of Method in Various Spirometric Determinations

The techniques described below apply to tests performed with either the nine liter or 13- $\frac{1}{2}$ liter Collins respirometer. The actual performance of these tests have been adequately described elsewhere.³

For use of these methods with instruments other than Collins respirometers, it is necessary only to determine the *actual* time interval represented by 32 mm. on the kymograph tracings and the actual volume of air per millimeter of pen excursion (bell factor) for the particular spirometer. Appropriate tables may then be constructed for the particular instrument.

TABLE I
CONVERSION OF VITAL CAPACITY AND OXYGEN CONSUMPTION
TRACINGS TO BTPS* CORRECTED GAS VOLUMES (milliliters)
for Collins 13 $\frac{1}{2}$ liter Respirometer

Bell factor: 1 mm. of pen deflection = 41.27 ml.

Formula for calculation of table:

Volume of gas corrected to BTPS* = mm. of pen deflection \times 41.27 \times BTPS* correction factor (Bell factor)

| Pen Deflection in Mm. | ATPS** | Temperature of spirometer gas in °C | | | | | | | | | | |
|-----------------------|--------|-------------------------------------|------|------|------|------|------|------|------|------|------|------|
| | | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
| 1 | 41 | 45 | 45 | 45 | 44 | 44 | 44 | 44 | 43 | 43 | 43 | 43 |
| 2 | 83 | 90 | 90 | 89 | 89 | 88 | 88 | 87 | 87 | 86 | 86 | 85 |
| 3 | 124 | 135 | 134 | 134 | 133 | 132 | 132 | 131 | 130 | 129 | 129 | 128 |
| * * * | | | | | | | | | | | | |
| 148 | 6108 | 6670 | 6630 | 6602 | 6573 | 6530 | 6499 | 6456 | 6425 | 6383 | 6346 | 6309 |
| 149 | 6149 | 6715 | 6678 | 6647 | 6617 | 6574 | 6543 | 6499 | 6468 | 6426 | 6389 | 6352 |
| 150 | 6190 | 6751 | 6723 | 6692 | 6661 | 6618 | 6587 | 6543 | 6512 | 6470 | 6432 | 6394 |

*BTPS—Body temperature, pressure, saturated with water: correction factor according to Comroe.⁴

**ATPS—Ambient temperature, pressure, saturated with water (no temperature correction).

***—In order to save space, only the first three and last three lines of the table are shown here. The complete table will be available with reprints of this paper.

1. Total Vital Capacity Volume and Time

The vital capacity tracing is usually obtained with the rapid kymograph speed (32 mm. in 12 seconds). The slide rule is superimposed upon the tracing as shown in the upper right portion of Figure 3. The rule is placed so that the intersect just to the left of the upper zero mark (Fig. 3-A) is superimposed upon the tracing at the point of maximal inspiration just as the expiratory curve begins, and the ruler is correctly oriented. The slide hairline is then slipped down to the point of maximal expiration (Fig. 3-B) and the number of millimeters is read on the right hand mm. scale. With this millimeter reading and the temperature, the total vital capacity in millimeters corrected to BTPS may be rapidly obtained from Table I. While the ruler is still in place, the duration of the vital capacity expiration is read directly in seconds on the vertical lined scale reading from line "A" to point "B." In Figure 3 this is exactly four seconds.

2. One, Two and Three Second Expiratory Volumes

The purpose of these measurements is the determination of the rapidity with which air can be expired. Thus the volume of air which can be ex-

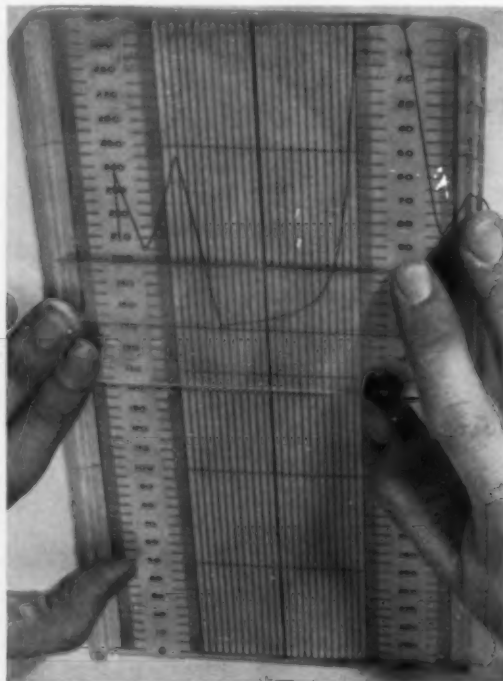


FIGURE 2: The longer (0-300 mm.) slide rule used particularly with tracing made on the 9 liter spirometer.

pired in one, two and three seconds is measured and may be expressed both in actual volume and in per cent of the total vital capacity.⁴

For these measurements, the slide rule is placed so that intersect "A" (Fig. 3) is superimposed upon the point of maximal inspiration at the beginning of the expiratory curve just as for the total vital capacity. The hairline is then slipped down to the intersect between the one second vertical division and the expiratory tracing itself (Fig. 3-1) and a reading in millimeters is made on the right hand mm. scale. The hairline is then slipped down to the two second intersect (Fig. 3-2) and another similar reading taken. This is repeated for the three second intersect (Fig. 3-3). Each of these millimeter readings for the one, two and three second expiratory volume together with the temperature will provide the volume in millimeters corrected to BTPS by referring to Table I. The per cent of the total VC would be 1 sec. expiratory volume x 100

Total vital capacity

with a similar ratio for the two second and three second expiratory volumes.

TABLE II
MAXIMUM BREATHING CAPACITY TABLE: for Collins 13½ liter Respirometer

| Bell factor—41.27 cc./min. | | | | | Ventilograph gear factor—11.09 | | | | | | | | |
|--|--------|--------------------------------------|-----|-----|--------------------------------|-----|-----|-----|-----|-----|-----|-----|--|
| The mm. in the left column refers to the mm. deflection of the ventilograph pen in a 12 second breathing period. The MBC value for this mm. deflection is read directly in liters per minute under the appropriate temperature column. | | | | | | | | | | | | | |
| Formula for calculating table: | | | | | | | | | | | | | |
| MBC in liters per min. = mm. of Ventilograph pen × Bell factor × Ventilograph gear corrected to BTPS* deflection in 12 sec. (41.27) factor (11.09) | | | | | | | | | | | | | |
| × 5 (to convert liters in 12 sec. to liters per minute) × BTPS* correction factor | | | | | | | | | | | | | |
| Ventilograph Pen deflection 12 sec. in Mm. | ATPS** | Temperature of spirometer gas in °C. | | | | | | | | | | | |
| | | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | |
| 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
| 2 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | |
| 3 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | |
| * * * | | | | | | | | | | | | | |
| 98 | 224 | 245 | 244 | 242 | 241 | 240 | 239 | 237 | 236 | 234 | 233 | 231 | |
| 99 | 227 | 247 | 246 | 245 | 244 | 242 | 241 | 240 | 239 | 237 | 236 | 234 | |
| 100 | 229 | 250 | 248 | 247 | 246 | 245 | 244 | 242 | 241 | 239 | 238 | 237 | |

*BTPS —Body temperature, pressure, saturated with water: correction factor according to Comroe.⁵

**ATPS—Ambient temperature, pressure, saturated with water (no temperature correction).

*** —In order to save space, only the first three and last three lines of the table are shown here. The complete table will be available with reprints of this paper.

4-F) and the number of millimeters read from the left hand scale. With this mm. reading and the temperature, the BTPS-corrected maximum breathing capacity can be read directly from Table II in liters per minute.

5. Resting Minute Ventilation

In this test the kymograph is run at the slow speed (32 mm. = 1 min.) for several minutes. The slope of the ventilograph tracing is inscribed, and the measurement made exactly as for the maximum breathing capacity. However, since the resting minute ventilation is measured on the slow speed, (1/5 of the rapid speed), the liters per minute as recorded in Table II must be divided by five. Calculation may be further simplified by measuring a two-minute period (Fig. 4, G-H) and dividing the value obtained from Table 2 by 10.

6. Maximal Midexpiratory Flow (Leuallen and Fowler²)

The expiratory curve which appears steepest on gross inspection is selected. The zero mark of the right hand scale of the "slide rule" is placed at the peak of inspiration and the total vital capacity measured on the millimeter scale. This figure is divided by four to obtain the number of millimeters for $\frac{1}{4}$ of the vital capacity volume (VC/4). With the zero mark of the right scale still superimposed upon the peak of

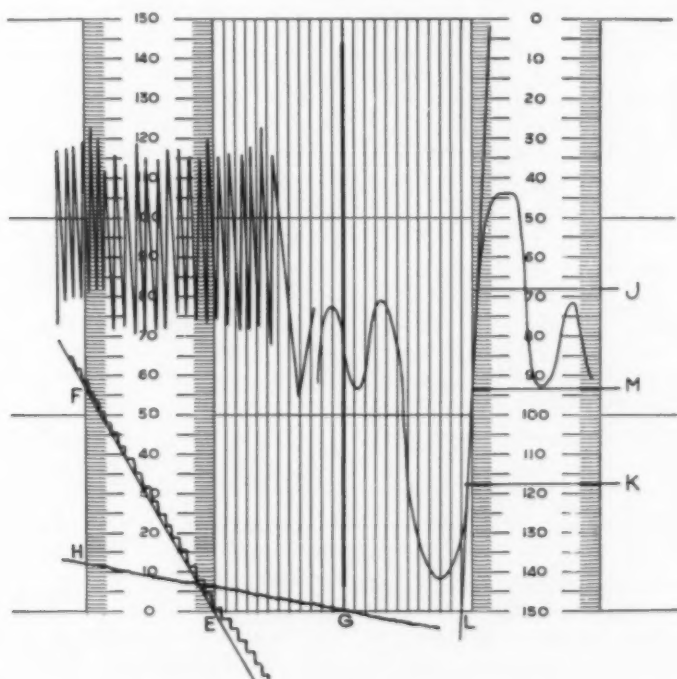


FIGURE 4: Diagram of the ruler as used for resting minute ventilation, maximum breathing capacity, and maximal mid-expiratory flow measurements.

inspiration, the number of millimeters of VC/4 is measured down the expiratory curve and a horizontal mark made with a thin pencil.

The zero mark of the *left* hand scale on the rule is then placed at the lowest point of expiration and the number of millimeters for VC/4 measured *up* the expiratory curve and a second horizontal mark inscribed. These steps have provided a point $\frac{1}{4}$ of the way *down* from peak inspiration (J) and a second point $\frac{1}{4}$ of the way *up* from maximal expiration (K).

A line is drawn connecting J and K (Fig. 4). The slope of this line expressed in liters per second is the maximal midexpiratory flow rate (MMEF).⁷ This "MMEF slope" may be measured as follows: The point, one second to the left of the 150 mm. line on the right hand scale (Fig. 4-L) is superimposed upon the "MMEF" slope line, and the ruler oriented with vertical lines. The point at which this slope crosses the "zero second" line (Fig. 4-M) is read in mm. on the left hand scale. The number of mm. together with the temperature provides from Table I a BTPS-corrected volume which is the MMEF expressed in liters per second.

If the slope is extremely steep, it might be necessary occasionally to use the 300 mm. slide rule (Fig. 2). On the other hand if the slope is comparatively flat, it is better to superimpose the ruler on the slope at the two second point and divide the millimeter reading by two.

Discussion

At the present time, pulmonary function tests are being carried out in hundreds of hospitals and increasingly in doctor's offices. One of the limiting factors in practical pulmonary function testing is still the time-consuming nature of both the testing techniques and the analysis of the spiograms. The methods herein described will not only expedite the analysis of the tracings, but will provide somewhat greater accuracy even in the hands of an average technician. An additional benefit of this "slide rule" technique is that by inscribing periodic vertical lines on the kymograph paper with the writing pen (for proper positioning of the slide rule), plain unruled paper may be substituted for the more expensive ruled kymograph paper. With the unruled paper, the tracings stand out more clearly and may be measured more easily in the absence of the confusing horizontal lines.

SUMMARY

1. A method is described for more rapid and efficient analysis of spiographic tracings utilizing a new transparent plastic slide rule and tables prepared for direct conversion of millimeter measurements of spiographic tracings into actual volumes and flow rates.
2. This method provides simpler and slightly more accurate measurements of spiographic tracings, eliminates much calculation, and allows the use of unlined and much less expensive spiographic paper in carrying out these tests.

Addendum

Recently, many pulmonary function laboratories have begun to use more rapid kymograph speeds, especially for more accurate evaluation of expiratory flow curves. A new Collins spirometer (Stead-Wells) provides a rapid kymograph speed of 32 mm. per second. The kymographs of the older Collins instruments may be converted to this rapid speed by simply substituting a more rapid motor for either of the two kymograph motors now in use.

The "slide-rule" is easily adaptable to these rapid speeds, since one large vertical division (32 mm.) would represent one second instead of twelve seconds. At this rapid speed, 0.5 second equals six small vertical divisions which permit an accurate measurement of the 0.5 second expiratory capacity.

RESUMEN

1. Se describe un método para realizar un análisis más rápido y eficiente de los trazos espirográficos usando una nueva regla plástica transparente, de deslizamiento, preparada para la conversión directa de las medidas en milímetros de los trazos espirográficos en los volúmenes verdaderos y medidas de las corrientes gaseosas.

2. Este método provee de medidas más sencillas y algo más exactas para los trazos espirográficos, elimina muchos cálculos y permite el uso de papel sin rayar y mucho menos caro para la espirografía al hacer estas lecturas.

ZUSAMMENFASSUNG

1. Es wird eine Methode beschrieben, die eine schnellere und leistungsfähige Analyse von spiographischen Aufzeichnungen unter Verwendung einer neuen transparenten Plastik-Gleitrolle und von Tabellen, die zur direkten Umwandlung der Millimetermessungen der spiographischen Aufzeichnungen in tatsächliche Volumina und Durchströmungswerte bestimmt sind.

2. Diese Methode gewährt einfachere und ein wenig genauere Messungen spiographischer Aufzeichnungen, macht viele Berechnungen unnötigt und ermöglicht den Gebrauch von nicht-liniertem und viel billigerem Spirographenpapier zur Vornahme dieser Tests.

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Steroid Acid Amides of Diamino Diphenyl Sulfone

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For the past several years, I synthesized various new steroid compounds and steroid derivatives for chemotherapeutic purposes. The series of the steroid acid amides of diamino diphenyl sulfone included 4-cholylamino-4'-amino diphenyl sulfone (B110) and 4-desoxycholylamino 4'-amino diphenyl sulfone (B111) which were chosen among representative members of this group for more detailed study. A brief survey of experimental findings on B111 is presented.

Figure 1 shows the chemical composition of the compound. It is a mono-desoxycholic acid amide of diamino diphenyl sulfone. The colorless crystals are soluble in alcohol, acetone, propylene glycol. B111 is slightly soluble in distilled water, however, in serum, stable solutions of 200 mcg/ml concentration can be obtained.

The crystalline pure compound was tolerated by guinea pigs and mice without apparent toxicity in large single doses and prolonged continuous administration as in a drug diet. Thus, mice were given single doses orally corresponding to 12 grams (12000 mg.) per kilogram. Mice and guinea pigs were fed 1 per cent drug diet for two months. Mice were injected intravenously with doses corresponding to 180 mg. per kilogram. No toxic symptoms were observed after administration of these massive amounts and only the physical circumstances of the method of administration precluded a further increase of the test doses. B111 was well retained in the animal body. Figure 2 demonstrates drug levels in tissues and blood three hours after intravenous injection of 100 mg. B111. The drug was present in the tissues in appreciable concentration when only traces were detectable in the blood. The situation was similar in the guinea pig during oral administration of B111 in active anti-tuberculosis chemotherapy. These findings illustrate the limitation of the importance of blood levels as indicators of the resorption and retention of B111 in the body.

Table I shows the *in vitro* activity of B111 as tested on the H37Rv strain and on several freshly isolated, "wild," strains of human tubercle bacilli. B111 was added to the culture medium in 0.05 ml. volume of alcoholic drug solution. The minimal inhibitory concentrations ranged from 3.12 to 25 mcg/ml. It is significant that the activity of B111 was essentially similar to that of the highly toxic parent compound diamino diphenyl sulfone (DDS). The tests were done in Youman's medium plus 10 per cent horse serum. Essentially similar values were obtained in plain Youman's medium and Dubos' medium. However, Youman's medium plus horse serum is the preferred one since the serum content increases the stability of the drug solution in the medium. The sensitivity values of the tested

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TABLE I
SENSITIVITY* OF H37Rv AND FRESHLY ISOLATED HUMAN STRAINS OF
TUBERCLE BACILLI TO B 111, DDS, STREPTOMYCIN AND INH;
YOU MAN'S MEDIUM PLUS 10% SERUM

| Strain | B 111 | DDS | Streptomycin | INH |
|--------|-------|-------|--------------|------|
| J. D. | 6.25 | 6.25 | 10 | 10 |
| S. K. | 3.125 | 3.125 | 100 | 5 |
| M. C. | 25 | 25 | <1 | <0.1 |
| C. M. | 6.25 | 12.5 | 10 | <0.1 |
| M. B. | 25 | 25 | 100 | 0.5 |
| H. B. | 12.5 | 12.5 | 10 | <0.1 |
| E. B. | 3.12 | 3.12 | 10 | >50 |
| F. B. | 12.5 | 12.5 | 1000 | >50 |
| R. C. | 12.5 | 12.5 | 100 | >50 |
| G. G. | 12.5 | 12.5 | 1000 | 10 |
| W. H. | 12.5 | 12.5 | >1000 | 10 |
| R. H. | 3.12 | 6.25 | >1000 | 10 |
| H. Q. | 12.5 | 12.5 | 10 | 10 |
| F. S. | 3.12 | 3.12 | 10 | 5 |
| H37Rv | 25 | 25 | 0.78 | 0.03 |

*Minimal inhibiting concentrations in mcg/ml.

strains to streptomycin and isoniazid indicate that there is no cross resistance between these agents and B111.

The mechanism of the action B111 was investigated by the method of infra red spectrography. The question as to whether the activity of B111 was due to the compound itself or to liberation of DDS was of crucial importance. Horse serum containing 100 mcg/ml B111 was incubated

FIGURE 1

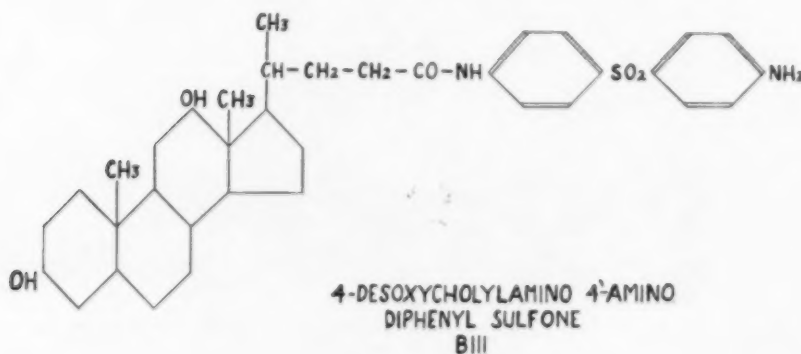


TABLE II
THE EFFECT OF B 111 AND PROMIN ON GUINEA PIG TUBERCULOSIS
RECORDED 90 DAYS AFTER SUBCUTANEOUS INOCULATION OF
0.1 mg. H37Rv. TREATMENT 1% DRUG DIET FOR 60 DAYS

| | No. of Survivals No. of Animals | Degree of Tuberculosis* | Per cent of Maximal Involvement | Chemo- therapeutic Effectiveness** |
|----------|------------------------------------|----------------------------|---------------------------------------|--|
| Controls | 7/12 | 12.1 | 75.6 | 0 |
| B 111 | 12/12 | 2.2 | 13.7 | 5.5 |
| Promin | 10/12*** | 3.6 | 22.5 | 3.36 |

*maximum 16

**TB of controls/treated

***2 guinea pigs died 18 and 23 days after inoculation

at 37° C. for four weeks and then extracted with ethyl alcohol and acetone. The dried residue of the evaporated extract was analyzed by means of infra red spectral comparison. Figures 3, 4 and 5 show the infra red spectra of desoxycholic acid, DDS and B111 respectively. Figure 6 shows the infra red spectrum of the serum extract. The spectral comparison of this material with B111, DDS and desoxycholic acid clearly showed that the serum extract contained the intact B111. There was no evidence of either DDS or desoxycholic acid.

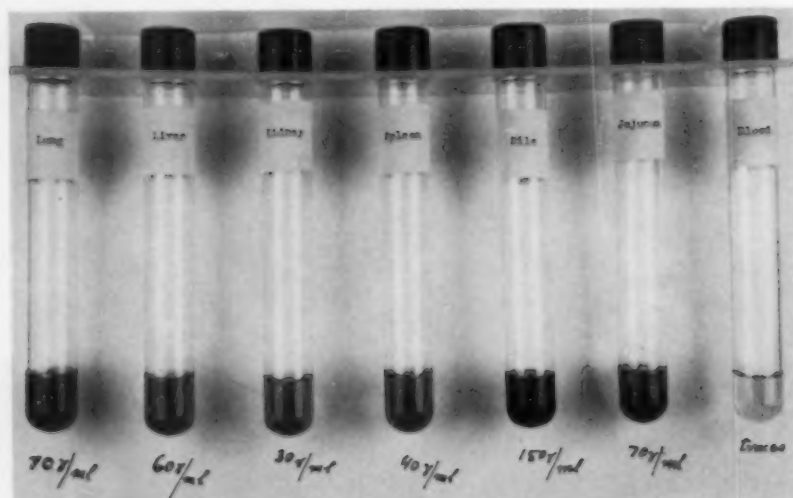


FIGURE 2: Drug levels in tissues and blood of rabbit three hours after intravenous injection of 100 mg. B 111. Marshall test in ethyl alcohol extracts of blood and tissues.

Table II demonstrates the effect of the oral administration of B111 on well established experimental guinea pig tuberculosis. The activity of B111 in suppressing the infection compared favorably with that of a standard toxic sulfone, promin. In experimental mouse tuberculosis, the suppressive effect of B111 was essentially similar to that found with other, but toxic, N-substituted sulfones.

In mixtures of B111 with streptomycin, synergism with striking bacteriostatic and bactericidal effects on tubercle bacilli was found.

Table III illustrates the combined bacteriostatic action of B111 and streptomycin. In the presence of one-half of the minimal inhibiting concentration of B111, there was a 16 fold potentiation of streptomycin. Bacteriostasis was obtained with a minute concentration such as 0.048 mcg/ml streptomycin. In the presence of 1/250 of the minimal inhibiting concentration of B111, equal to 0.1 mcg/ml there was a four fold increase of the original streptomycin potency. In previous studies on the combined action of streptomycin and dihydro-streptomycin with isoniazid on tubercle bacilli, the optimal effect was restricted to simple addition. The findings were similar with other combinations of the presently used anti-tuberculosis drugs.

Table IV and Figure 7 demonstrate the bactericidal effect of B111-streptomycin mixtures. The sterilizing effect within 48 hours as obtained with streptomycin alone at the prohibitive concentration of 10,000 mcg/ml was reproduced in mixtures with B111 at the "clinical" level of 10 mcg/ml streptomycin. The conditions of the test were exacting since the bacillary contents of full Dubos' cultures (0.1 mg. bacilli) were subcultured on Petragnani tubes. The plating method with serial dilutions is sensitive to comparatively small changes in the census of the surviving bacillary population. The method used in this experiment is only suitable for the demonstration of massive bactericidal action approaching complete sterilization.

The correlation of the pharmacological and antibacterial properties of these compounds was unexpected. It has been known that the reduction

TABLE III
SYNERGISM OF B 111 AND STREPTOMYCIN (S) BACTERIOSTATIC EFFECT
Combined Action of B 111 and Streptomycin on Human
Tubercle Bacilli in Dubos' Medium

| mcg/ml | | Minimal Inhibiting Concentrations Bacteriostatic Units | |
|--------|-------|---|------|
| B 111 | S | B 111 | S |
| 25 | 0 | 1 | 0 |
| 0 | 0.78 | 0 | 1 |
| 12.5 | 0.048 | 1/2 | 1/16 |
| 1 | 0.095 | 1/25 | 1/8 |
| 0.1 | 0.19 | 1/250 | 1/4 |
| 0.01 | 0.78 | 1/2500 | 1 |

of the toxicity of the sulfones as obtained by blockage of one or both amino groups of DDS has always been paralleled by a corresponding reduction of activity. Moreover, it was repeatedly demonstrated that any *in vitro* and *in vivo* activity of the derivatives was due to hydrolysis and

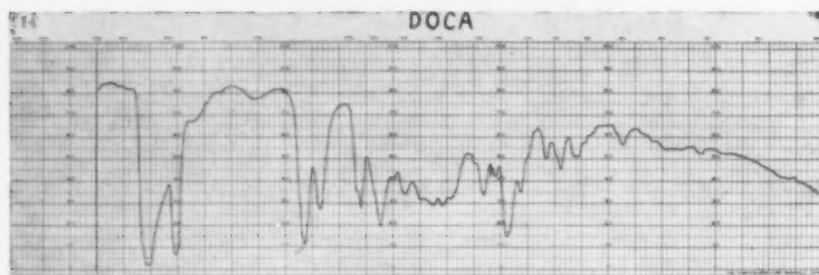


Fig. 3

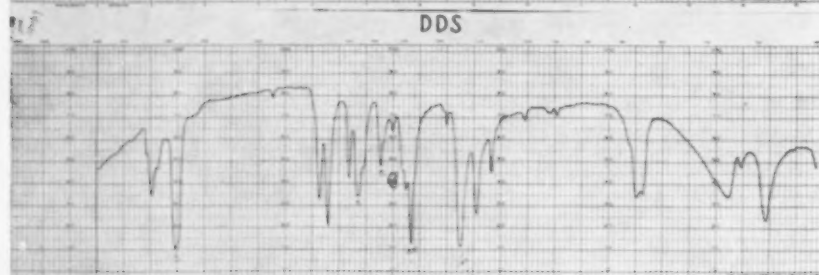


Fig. 4



Fig. 5

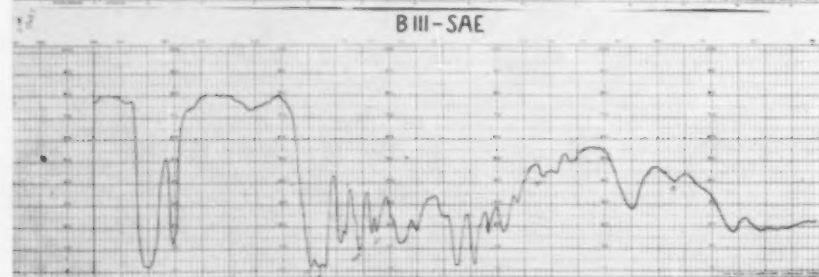


Fig. 6

Figure 3: Infra red spectrum of desoxycholic acid.—Figure 4: Infra red spectrum of 4,4'-diamino diphenyl sulfone.—Figure 5: Infra red spectrum of B 111.—Figure 6: Infra red spectrum of dried residue of alcohol-acetone extract of horse serum containing 100 mcg/ml B 111 incubated at 37°C for four weeks.

TABLE IV

SYNERGISM OF B 111 AND STREPTOMYCIN (S) BACTERICIDAL EFFECT
Subcultures of Washed Human Tubercle Bacilli on Petragnani's Medium after Exposure
of Bacillary Suspensions to Drugs in Dubos' Medium for 48 Hours

| Drug Concentration* in Dubos' Medium | | Petragnani Cultures | Drug Concentration* in Dubos' Medium | | Petragnani Cultures |
|---|-------|------------------------|---|-------|------------------------|
| Streptomycin | B 111 | | Streptomycin | B 111 | |
| 1 | 0 | 4+ | 1 | 5 | 2+ |
| 10 | 0 | 4+ | 10 | 5 | few colonies |
| 100 | 0 | 3+ | 100 | 5 | few colonies |
| 1000 | 0 | 2+ | 1000 | 5 | 0 |
| 10000 | 0 | few colonies | 10000 | 5 | 0 |
| 0 | 0 | 4+ | | | |
| 0 | 5 | 3+ | | | |

*mcg/ml

liberation of DDS. Thus acylated derivatives are practically inactive *in vitro*. Their activity *in vivo* is dependent upon partial hydrolysis to DDS with corresponding reappearance of chronic toxicity. However, the activity of B111 is due to the compound itself as proved by infra red spec-

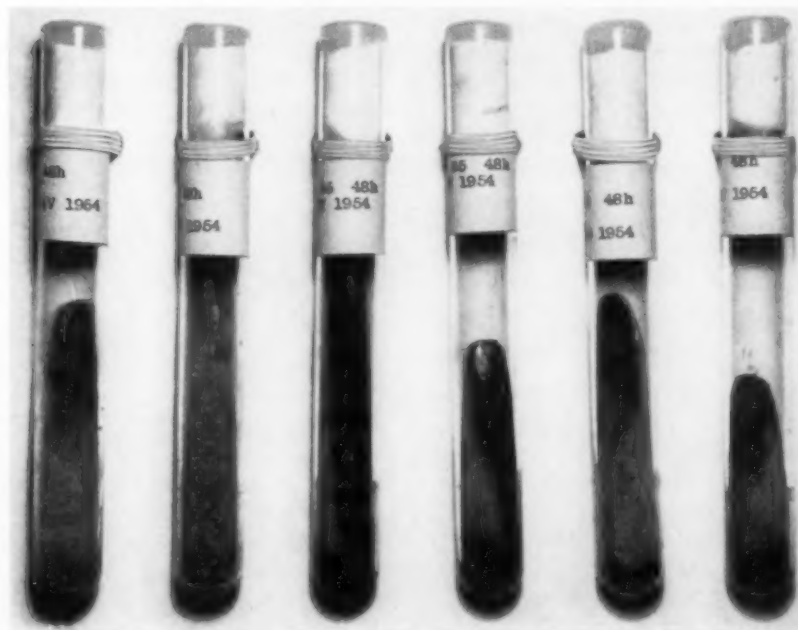


FIGURE 7: Bactericidal effect of B 111-Streptomycin mixtures. Subcultures of washed human tubercle bacilli on Petragnani's medium after exposure of bacillary suspensions to drugs in Dubos' medium for 48 hours. 1) Control; 2) 5 mcg/ml B 111; 3) and 4) 100 mcg/ml streptomycin plus 5 mcg/ml B 111; 5 and 6) 100 mcg/ml streptomycin.

trography. The high *in vitro* and *in vivo* activity without apparent toxicity of B110 and B111 are unique qualities for drugs of this type. The results indicate that the substituents used in these compounds are not inert blocking agents of all biological activities, but are detoxifiers on the one hand and chemotherapeutic activators on the other hand. The failures of previous sulfone therapy in the treatment of human tuberculosis were explained by the inadequacy of the tolerated dosage. In view of the data summarized above, B110 and B111 were recommended for a therapeutic trial in humans using full weight for weight doses which were active, but non-toxic in the animal experiments. In a preliminary clinical study with B111 done by E. H. Robitzek and I. J. Selikoff at Sea View Hospital,* the administration of such doses proved to be perfectly feasible.

The bactericidal synergism of these compounds and streptomycin appears to offer a new and potent anti-tubercular drug combination.

SUMMARY

A series of steroid acid amides of diamino diphenyl sulfone was synthesized and explored for chemotherapeutic activity.

4-desoxycholylamino 4'-amino diphenyl sulfone (B111), a representative member of this new group of compounds was tolerated in large amounts by experimental animals without toxic symptoms when administered orally or intravenously.

It was active *in vitro* on "wild" and laboratory strains of Myco. tuberculosis and active *in vivo* in experimental animal tuberculosis in the range of diamino diphenyl sulfone and other, but, toxic derivatives of DDS.

Activity of B111 was due to the unhydrolized compound as documented by infra red spectral comparisons. The steroid moiety of the compound appears to act simultaneously as a detoxifier and a chemotherapeutic activator.

In mixtures with streptomycin, synergism with striking bacteriostatic and bactericidal effects on Myco. tuberculosis was observed.

In a preliminary clinical study, the administration of large doses of B111 was perfectly tolerated by humans.

RESUMEN

Se investigó la actividad quimioterápica de una serie de sustancias sintetizadas de los esteroides aminoácidos de la diamino difenil sulfona.

El 4-desoxicolilamino 4'-amino difenil sulfona (B 111), un compuesto representativo de este grupo se toleró en grandes cantidades por los animales de experiencia sin efectos tóxicos ya sea por vía oral o intravenosa.

Fué activo en cepas "silvestres" o de laboratorio del micobacterium tuberculosis y activo en los animales de experiencia tanto como las diamino-difenilsulfonas u otras que son derivados tóxicos de la DDS.

La actividad del B 111 se debe a un compuesto no hidrolizado según lo que informa la comparación espectral infra-roja. La mitad esteroide del

*This study was made possible by grants in aid of the Lasker Foundation and the New York Foundation used to cover expenses for the production of B 111.

compuesto parece actuar como desintoxicante y como activador quimioterápico.

En mixturas con estreptomycin, se observó notable sinergismo bacteriostático y bactericida sobre el bacilo tuberculoso.

En un estudio clínico preliminar se observó que administración de grandes dosis de B 111 fué perfectamente tolerada.

RESUME

On a effectué la synthèse d'un groupe d'amides acides stéroïdes de la sulfone diaminodiphényl et on l'a expérimenté pour connaître son activité chimiothérapique.

La sulfone 4-desoxycholylamino 4'-amino diphenyl (B 111)—un type représentatif de ce nouveau groupe de composés—, fut tolérée en grandes quantités par les animaux d'expérimentation sans symptômes toxiques, administrée par voie buccale ou par voie intra-veineuse.

Les produits furent actifs *in vitro* sur des souches brutes et des souches de laboratoire de bacilles tuberculeux, et actifs *in vivo* sur la tuberculose animale expérimentale, en ce qui concerne la sulfone diamino-diphényl et autres, mais les dérivés de la DDS furent toxiques.

L'activité du B 111 fut imputable au composé non hydrolysé, selon les indications données par les comparaisons du spectre infra-rouge. La moitié stéroïde du composé semble agir à la fois comme un désintoxicant et comme un activant chimiothérapique.

Dans les associations avec la streptomycine, on observa une synergie avec des effets bactériostatiques et bactéricides remarquables sur le bacille tuberculeux.

Dans une étude clinique préliminaire, l'administration de doses élevées de B 111 fut parfaitement tolérée chez l'homme.

ZUSAMMENFASSUNG

Eine Serie von Steroidsäure-Amiden von Diamino-Diphenyl-Sulfon wurde synthetisiert und auf chemotherapeutische Aktivität geprüft.

4-desoxycholyamino 4'-amino diphenyl sulfon (B 111), eine repräsentatives Glied dieser neuen Gruppe von Substanzen, wurde in grossen Mengen von Versuchstieren vertragen ohne toxische Symptome bei oraler oder intravenöser Zufuhr.

Diese Substanz war aktiv *in vitro* auf "wilde" und laboratoriums-Stämme von Myco. tuberculosis und aktiv *in vivo* bei experimentieller Tiertuberkulose in demselben Grad wie Diamino-Diphenyl-Sulfon und andere, jedoch toxische Abkömmlinge von DDS.

Die Aktivität von B 111 war der nicht hydrolysierten Verbindung zuzuschreiben, wie aus Vergleichenden Infrarot-Spektren hervorging. Der Steroid-Anteil der Verbindung scheint gleichzeitig entgiftend und chemotherapeutisch aktivierend zu wirken.

In Mischungen mit Streptomycin wurde ein auffallender bakteriostatischer und baktericider Effekt auf Myco. tuberculosis beobachtet.

Während einer vorläufigen klinischen Untersuchung wurde die Gabe von grossen Dosen von B 111 vom Menschen tadellos vertragen.

The Role of the Health Department in Tuberculosis Control

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The Public Health Services' recent study of the unhospitalized tuberculosis patient is a shocking reminder of our failure to put into practice the control procedures currently available. Many of our committees continue to follow patterns of methods which have been known for long periods to *not* be the most yielding in results. We just do not use all the facts at hand. The recent survey by "Searchlight" has brought to light many inadequacies of community tuberculosis programs. One of the most glaring defects, revealed that these counties which did not have a health department knew little or nothing about the local tuberculosis problem. In general it may be stated that where the health department was lacking the services for follow-up, case finding, treatment, and supervision of the medically indigent tuberculosis case were also missing. Too many of our counties possess a part-time County Health Officer, as a rule untrained in modern public health practices, and without local resources to follow cases of reported tuberculosis. Infrequently is it possible for them to salvage any of the information on tuberculosis cases given them from official channels. Our major problem is to encourage these counties to provide health departments so that the people can receive needed services besides those that should be provided for tuberculosis cases and suspects.

The health department should be the core or hub of all health services in the County. It is true that few health departments can hope to provide all the health services needed. Even when all the health resources, and the various groups providing various health means have been marshalled and coordinated, deficiencies are likely to exist. The public's appetite for health services seems to be an insatiable one.

The availability of community health resources does not follow wishful thinking but from community organization. Community organization may be described as a method and a process by which needs are determined and resources mobilized and adjusted to meet those needs. The general aim of community organization is to bring about and maintain a progressively more effective adjustment between social welfare resources and social welfare needs. Only through concerted action can a community secure the services and facilities it desires. When the existing services have been surveyed and the needs determined, the health department should provide the leadership in effecting coordination. Any organization—but usually it is one which is well established and recognized in the community—can initiate coordination.

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To begin with, coordination is possible in a climate that makes provisions for it. Producing such a climate is largely a matter of education of the public and of professional workers. It is a matter of education on the practical values of coordination, to a point where individuals and organizations will do more than give lip service to the idea, will put forth the energy and will exercise the determination to make coordination work. An example of this thinking is the State Tuberculosis Coordinating Council.

Coordination needs financing. The care and supervision of tuberculosis patients requires both public and private funds. Those who administer funds must be alert to improved ways of using money both within their organization and jointly with other agencies in coordinated activities. It should be pointed out that many times, better services can be supplied with present funds if they were used to best advantage. The possibility of financial aid grows with the increase of knowledge about coordination.

The health department can provide counselling and referral services for those patients requiring continuing care, as well as offering direction and guidance to persons unfamiliar with the public, private health and welfare agencies' resources of the community. Keeping abreast of changing conditions would offer no challenge to the smaller counties.

One of the most valuable functions of a health department in tuberculosis control can reside in the maintenance of a case register. The case register should be kept up-to-date and can provide a useful tool and guide to the tuberculosis needs of the community. It should be possible to check the register and determine the status of every case which has been reported to the health department. Unless the register is used properly, it is not worth the effort to even provide one.

General services provided by the health department include the needed nursing services. These include supervision in the home for both the pre and post hospital patients as well as those which never leave the community. The general supervisory nursing services provided the patient will include education of the patient and family regarding the disease and in some instances, actual treatment as recommended by the physician. One of the greater contributions can be the locating of reported cases, suspects, and contacts and getting them under medical supervision and clinics for proper diagnosis. A nurse will also assist the patient, when the disease status so warrants, toward rehabilitation. The extensive use of effective drugs has changed the tuberculosis picture in the average patient from an acute communicable, highly fatal disease, to a chronic disease that is seldom fatal and communicable only periodically. One of the major results of drug treatment is prolonging the life of the patient. Since we do not know the full effects of drugs on the long-term condition of tuberculosis patients, these people will have to remain under observation and be checked periodically to determine their disease status. With more drugs being used in out-patient departments and more supervision being required, the long-term trend is to require more nursing services, and depending upon the volume of patients, those health departments having

major tuberculosis programs will eventually reflect in the need for additional nurses. In the future the health department nurse can be expected to be called upon to play part in increasing the non-specific, but enhancing the resistance of the human body to the invading organisms. These measures will include improved standards of living, improved nutrition, and lessening the physical and emotional stresses of the patient.

Another major contribution of the health department can be year-round case findings. Periodic mass surveys have had their place but are no substitutes for continuous case finding. A good program can begin with tuberculin testing programs and examination of the positive reactors in areas of high infection prevalence. As the mortality rate decreases, there will come a time when mass x-ray surveys will no longer produce an economical yield. The case finding program, of necessity, will be focused on recognizing the infectious cases and breaking the chain of infection to those which are non-infected. More emphasis will be directed toward the epidemiological study of cases found, examining properly the contacts to locate new cases. More attention in the future will be likewise be given to those individuals who have already been infected and every effort will be made to prevent further development of disease. Many of our present cases may well represent breakdown from infection which occurred years ago. Other segments of population will need to be included in the case finding activities of the health department and should include people living in high prevalence areas, recipients from welfare assistance, and that population over 45 years of age.

As has already been stated, attention in the future will be crystallized upon breaking the chain of infection upon those individuals in the community who are infectious. The recalcitrant infectious case of tuberculosis will occupy a prominent place in the spot-light. When public education has been reached to the degree that each infectious case of tuberculosis and its potential can be appreciated, then the health officer will play a more vital part than he has in the past in the legal restraint of these infectious cases.

The health department or the regional health department laboratory provides the needed laboratory services for the indigent and medically indigent cases of tuberculosis. As more interest becomes focused on the control of the infectious case and with more cases to be evaluated from the use of new antimicrobial drugs, new demands on the laboratory services can be expected. Many of the laboratories now perform tests for bacterial identification and resistance to the various drugs. As the importance of bacterial resistance becomes better appreciated in local clinics, it will be necessary to have more completely equipped laboratories.

Through the out-patient services provided by the health department, the opportunity is present for public health education of professional and non-professional personnel. Too often health departments have not assumed the responsibility which rests on their shoulders. Many of the smaller counties are in real need of training and developing interest of local physicians in assisting in the local tuberculosis program and modern treat-

ment schedule of tuberculosis patients. The general practitioner can be expected to play an increasingly significant role in the home care of tuberculosis cases. With greater numbers of arrested cases in the community requiring long periods of observation and with lessened periods of hospital stay, the pattern of formal medical education should be coordinated to meet this trend.

One of the more valuable functions a health department can perform is a periodic, but regular evaluation of the tuberculosis program along, with the needed cost studies. Many of our counties would be amazed at the cost of finding a case of tuberculosis in the "teen" age group. Yet, year after year they continue to place major emphasis in the case finding program towards this captive population. Blindly we continue expending our efforts in less productive channels. This same force, if directed to the proper areas and proved population segments, could be definitely rewarding in the case yield. Our thinking in tuberculosis control should be directed to these vulnerable spots.

One of the commodities of a health department which is difficult to attach a dollar sign is leadership. Only through having personnel well trained in all of the various disciplines of public health can a county enjoy the full benefits of a good public health program. Well trained personnel of the type referred to are in short supply and are apparently expensive. Few realize, however, that they can ill afford to compromise with inferior health services. Good health for the citizens of a county is a purchasable asset. Through the Commissioner of Health's efforts, the best possible trained public health officers are being recruited that the market will supply. Every attempt is being made to recruit career-minded public health personnel and extend good health services to every citizen of the state.

The director of the local health department should always capitalize on the opportunity to provide leadership in the planning of the local tuberculosis control program. Since the health department will be involved in many of the aspects, it is imperative that the director offer medical leadership and bring in those medical agencies which will be involved in the program. Some local tuberculosis programs suffer because of the lack of medical planning. It also becomes the responsibility of the health department to develop and use its prestige. The personnel and activities of the department should always have the respect and confidence of the public. There should never be any question of the integrity of the health workers or the service of the department. The personnel of the department should never lose sight of the quality of humbleness and always regard themselves as a public servant contributing public service.

With public confidence regarding the elimination of tuberculosis as a health problem at its greatest height and with many people assuming a complacent attitude toward the disease, and in some instances agencies looking for new fields of endeavor, the health department has some responsibility in informing the public that the disease is not eradicated. We still have a problem in tuberculosis control.

Although it is not the direct responsibility of the health department, it

should lend its prestige and confidence in recommending routine x-ray examinations of hospital admissions for unrecognized cases of tuberculosis. Some of the current figures indicate routine hospital admissions have 10 times the yield of ordinary mass x-ray surveys. The health department can at least place its stamp of approval on this recommended procedure.

Last but not least, the health department can, if personnel, funds and interest are present, play a contributing part toward further research regarding the disease. There is vital need for better methods of case findings, treatment and increasing the resistance of the infected and non-infected individual, not even to mention the need for better drugs, sharper tools and tests for diagnosing the disease, and means of providing better continuity of medical care.

SUMMARY

The County Health Department should serve as the hub of all health services and should offer leadership in coordinating and integrating the community health resources. It should offer counselling and referral services for persons unfamiliar with the public, private, health and welfare resources of the county.

The County Health Department usually maintains the case register of all known tuberculosis cases and provides nursing service in addition to year-round case finding activities. The control of recalcitrant tuberculosis cases usually is built around the local health department. Many local health departments provide needed laboratory tests, including sputum studies of suspected tuberculosis cases.

The Health Department should conduct periodic and regular evaluations of the local tuberculosis program and offer leadership in the planning of the control program. It has an obligation to provide information and the problem of tuberculosis to the public and should discourage complacency. Every health department should encourage routine chest x-ray films on all hospital admissions. If interest, funds and personnel permit, research studies should be conducted regarding the disease.

RESUMEN

El departamento de salubridad del condado debe servir como el eje de todos los servicios de salud y debe encabezar la coordinación e integración de los recursos de salubridad de esa comunidad. Debe ofrecer consejo y orientación para las personas no familiarizadas con los recursos de salubridad del condado ya sean públicos o privados.

El departamento de salubridad del condado generalmente mantiene el registro de casos conocidos de tuberculosis y provee de servicio de enfermeras además de la búsqueda de casos durante todo el año.

El control de los casos difíciles de conducir es una de sus actividades. Muchos departamentos de estetipo dan servicios de laboratorio, estudios de esputos de los casos sospechosos.

El servicio de salubridad debe llevar a cabo estimaciones regulares de los planes de lucha antituberculosa y ofrecer conducción en la planeación

de las tareas. Tiene la obligación de proporcionar información y presentar al público el problema así como evitar las complacencias. Todos estos servicios deben alentar los proyectos de roentgenfotografía de admisión a todos los hospitales.

Si hay interés y los fondos y el personal lo permiten, se deben hacer trabajos de investigación de la enfermedad.

ZUSAMMENFASSUNG

Das Kreisgesundheitsamt soll als Mittelpunkt dienen für alle Arten der Gesundheitspflege und soll die Leitung ermöglichen bei der Koordinierung und Vervollständigung der Hilfsmittel für das öffentliche Gesundheitsleben. Es soll beratende und bezügliche Dienste leisten für Personen, die nicht vertraut sind mit den öffentlichen, privaten, gesundheitlichen und fürsorgerischen Einrichtungen des Kreises.

Das Kreisgesundheitsamt führt gewöhnlich das laufende Register aller bekannter Tuberkulosefälle und sorgt für Pflegedienste zusätzlich zu den jährlichen Arbeiten zur Auffindung neuer Fälle. Die Aufsicht über uneinsichtige Tuberkulosefälle ist gewöhnlich mit dem örtlichen Gesundheitsamt verknüpft. Viele örtliche Gesundheitsabteilungen sorgen für die notwendigen Laboratoriumsuntersuchungen einschl. Sputumproben von verdächtigen Tuberkulosefällen.

Die Gesundheitsbehörde muss periodische und regelmässige Auswertungen der örtlichen Tuberkulosebekämpfungspläne durchführen und sich zur Leitung bei der Planung der Tuberkulosebekämpfung erbieten. Sie hat eine Verpflichtung zur Beschaffung von Informationen über das Tuberkuloseproblem für die Öffentlichkeit und hat die Selbstgefälligkeit zu bekämpfen. Jede Gesundheitsabteilung muss die planmässige Thorax-Röntgenaufnahme bei allen Krankenhauseinweisungen fördern. Wenn es das Interesse, die Geldmittel und das Personal zulassen, müssen Forschungsarbeiten hinsichtlich der Krankheit ausgeführt werden.

Pre- and Para-Medications in Bronchoscopy^{*}

The Concept of "Broncho-Softening"

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It has become easy to explore the respiratory tract—the necessary instruments are greatly improved and easy to manipulate, and the use of local anesthesia is well established. Medication which, as a sedative, combines morphine and atropine, the anti-secretive effect of which is excellent, is satisfactory to bronchologists in a great majority of cases, so that few attempts have been made to modify the technique generally used.

Nevertheless, there are some difficult bronchoscopies which are not to say "impossible." Often the difficulties are caused by the patient's fears, whether at the first trial or at a series of examinations; or they may result from buccal-mandibular malformation (for example, where the face has been mutilated). Once the glottal passage has been traversed, apart from a stricture of organic origin, one may encounter bronchial spasm, or sometimes a curve to the left more accentuated than usual.

To improve the technique and, therefore, the results of endoscopy, one would have to reinforce or perfect the means of:

1. Dissipating the patient's fears.
2. Facilitating the tracheal tube insertion.
3. Eliminating any eventual bronchial spasm and even extending the passage of the tube beyond the usual limits.

Pre-medication would be affected mostly by the first two indications, and para-medication by the third. But, indeed, several of these indications overlap and it is only for purposes of classification that we list them chronologically.

I. PRE-MEDICATION

Out of the many drugs we explored with a view to their effective use prior to intubation, only two were kept: diethazine and an anesthetic steroid (Viadril).

1. *Diethazine* (or 2987 R.P.)^{**}

For the morphine-atropine pre-medication used currently we substitute a combination of diethazine with atropine.¹

Let us recall briefly the properties of 2987 R.P. This product has been used in the treatment of Parkinsonian syndromes. It is a salt of diethylamino-2'-ethyl N-dibenzopara-thiazine.

It results from the condensation of a salt derived from diethylamino-ethanol which enters into the composition of numerous medicaments (pro-

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^{**}Latibon (Bayer).

caine, certain spasmolytics and sympatholitics) and of an elixir of thiodiphenyl-amine.

In the parasympathetic ganglions, 2987 R.P. causes a vagal paralysis without the effect of the acetylcholine being appreciably modified.

In the sympathetic ganglions, it produces a similar paralysis which manifests itself, for example, by its antagonism to the tension-causing effects of nicotine.

It also opposes adrenalin secretion of the adrenal medulla following the stimulation of the splanchnic nerves provoked by asphyxiation.

It also exercises a central analgesic action.

Pre-medication by diethazine aims at preventing, or diminishing, bronchospasm, an action resulting from the anti-nicotinic properties of 2987 R.P. In fact, experience has shown us further results: not only does diethazine simplify intubation, but it often permits attaining unusual depths in the bronchial tree without forcing the basal bronchi (as is shown by a cinematographic sequence showing an air cyst, distal and invisible on x-ray films, either standard or tomographical). This is the first demonstration of the "bronchial-softening" effect.

The dose of diethazine, injected *intramuscularly* a quarter of an hour before the local anesthetic, is the same for all patients: 250 mg. dissolved in 5 ml. of physiological saline, mixed with 1.0 mg. of atropine sulphate in the same syringe.

The product has only one drawback, and that a minor one. The day after the injection it causes a rather severe pain *in situ*, which may persist for two or three days. A greater dilution in physiological saline and dividing the total dose into two injections, one on the right, and the other on the left, corrects this drawback to a certain extent.

2. Anesthetic steroid (P 55 or Viadril)

Even though diethazine produces consistently satisfactory effects by a simple method, there remains, nevertheless, a certain group of patients whose emotions or tenseness risk upsetting the endoscopic exploration. For them we can use an anesthetic steroid, the succinate of 21-hydroxypregnandione, investigated by Laubach and his collaborators.

This product is a white crystalline powder, soluble in water, with a molecular weight of 432. In solution, its pH is 8.5 to 9.8. It has no toxic effect, and does not cause retention of sodium.

In weak doses it causes simple hypnosis. In strong doses (for example, 1.5 gm.) it produces anesthesia, which begins after five minutes and may continue for a long time.

Bronchoscopy usually requires neither deep nor prolonged anesthesia. In any particular patient, the use of P 55, as pre-medication, is justified by the state of calmness it produces and by its quasi-selective action on the striated glottal muscle, facilitating greatly the tracheal tube insertion.

It is on this account that we have been led to modify the doses injected in general anesthesia by the team from the University of California, and even the technique of injection.² Two hours before the endoscopic exploration, we start an intravenous infusion into an antecubital vein (using a

TABLE I

| Names | Pre-medication (Dithazine 250 mg. + Atropine 1 mg.) | Para-medication (Succinylcholine 2 mg. + Lignocaine 5 mg.) | Broncho- softening Effect | Comments |
|------------|--|--|------------------------------|--|
| Dor. . . | I.M. injection | | + | |
| Mar. . . | id. | | + | |
| Chat. . . | id. | | ++ | |
| Gol. . . | id. | | ++ | |
| Tho. . . | id. | | + | sleep during the procedure |
| Cai. . . | id. | | 0 | organic narrowing |
| Azé. . . | id. | | 0 | organic narrowing |
| El. H. . . | id. (+ previous Viadril) | | ++ | |
| Dur. . . | id. (+ previous Viadril) | | + | |
| Pou. . . | id. (+ previous Viadril) | | + | |
| Le G. . . | id. | I.V. injection | ++ | visibility of the division of Nelson bronchus |
| Thom. . . | id. | id. | ++ | |
| Mart. . . | id. | id. | ++ | left curve ++ passed over |
| Le F. . . | id. | id. | ++ | left curve + passed over |
| Ker. . . | id. | id. | + | |
| Tid. . . | id. | id. | ++ | |
| Der A. . . | id. | id. | 0 | organic narrowing |
| Rol. . . | id. | id. | ++ | spasmodic narrowing |
| Aug. . . | id. | id. | ++ | |
| Blo. . . | id. | id. | ++ | |
| Gic. . . | id. | id. | ++ | |
| Rem. . . | id. | id. | ++ | |
| Yah. . . | id. | id. | ++ | |
| Bou. . . | id. | id. | ++ | |
| Fil. . . | id. | id. | ++ | |
| Zac. . . | id. | id. | ++ | spasmodic narrowing |
| Tab. . . | id. (+ previous Viadril) | id. | + | no local anesthetics |
| Ves. . . | id. (+ previous Viadril) | id. | + | |
| Luc. . . | id. (+ previous Viadril) | id. | + | |
| Hel. . . | id. (+ previous Viadril) | id. | ++ | |

20 gauge needle) of 250 ml. physiological saline to which is added 5.0 mg. of Viadril per kilogram of body weight. The speed of infusion is regulated to last for two hours.

From this, one does not obtain a true anesthetic effect, but before long a complete euphoria is established, or a total indifference to the procedure. At completion of the injection, the subject is capable of getting up unaided, and is ready for the laryngo-tracheal anesthesia. From here on the procedure becomes simple and, once the bronchoscopy is concluded, the patient quickly returns to normal activity.

This technique of preliminary intravenous infusion avoids the salivary hypersecretion, which the rapid intravenous injection of the anesthetic steroid provokes. The atropine, always concurrently used, diminishes still further the risk of sialorrhea.

As this technique is not as simple as the first, we need to use P 55 only in the following cases:

1. Anterior failure of the glottal passage.
2. Very frightened or agitated subjects.
3. Bucco-mandibular malformations.*

Pre-medication, then, by diethazine alone, or by diethazine and Viadril, permits one to obtain a certain "broncho-softening" effect with the first drug, and quieting effects, accompanied often by an actual glottal gaping, with the second.

The "broncho-softening" effect is enhanced by para-medication, which we accomplish with a synthetic curare-like compound.

II. PARA-MEDICATION

The first investigations of two of the authors, with Paillas and Maroger,³ were concentrated on the natural alkaloid of curare (d-tubocurarine), the particular action of which, on the bronchial tonicity, has been described precisely under the name of "*broncho-softening effect*." We have abandoned it recently in favor of *diiodide of succinylcholine*,⁴ one of the most remarkable among the numerous synthetic curare-like compounds proposed in recent years, by reason of its transitory action, which makes it especially easy to handle. Bovet and his collaborators⁵ have described this product. Its brief action appears to be connected with its rapid hydrolysis by the plasma cholinesterase, whereas most of the curare-like compounds are essentially excreted by the kidneys.

With succinylcholine one finds again the *broncho-softening effect* of d-tubocurarine. As we stressed at the very beginning of our studies on the use of curare in bronchoscopy,³ "the bronchi become soft, extraordinarily flaccid; it almost seems as if they open up before the bronchoscope; they permit an easy progression of the tube, which reaches the terminal branches of the bronchial division and sometimes even goes into them. The leftward bronchial curve is easily overcome." The only cases in which observations of this extent are not possible are in the *organic* stenoses.

*One should carefully estimate any eventual risk in a few clinical cases, such as marked respiratory insufficiencies or severe vegetative disturbances (asthma).

In other words, this broncho-softening effect may be appreciated:

1. By the facility which one experiences, once the scope has been introduced into the respiratory tract, in moving the instrument back and forth inside the bronchial lumen.

2. By the possibility, when encountering a bronchial zone which is in spasm, of traversing it, once an injection of this product is given.

To sum up, such "broncho-softening" would not be appreciated without the presence of the tube in the bronchus; it is only noted by mediate tactile perception. One can see how this distinguishes it from bronchodilatation (Figure 1).

The interest in these facts appears to us twofold:

1. From the doctrinal point of view, they show the *action of curare on smooth muscle*, by the probable intermediary of the neuro-vegetative system.

Years ago Vulpian and, more recently, Langley pointed out that curare blocks the synaptic ganglionic transmission. Luco and Mesa utilized the pupillary response of the cat and the contraction of the nictating membrane, and demonstrated the blocking of cholinergic synapses. MacIntyre concedes that all the tissues where acetylcholine intervenes are susceptible to curare in varying degrees.

Clinically, Gross and Cullen point out the diminution of intestinal peristalsis; Batelli, and Switski, that of contractions of the stomach; and

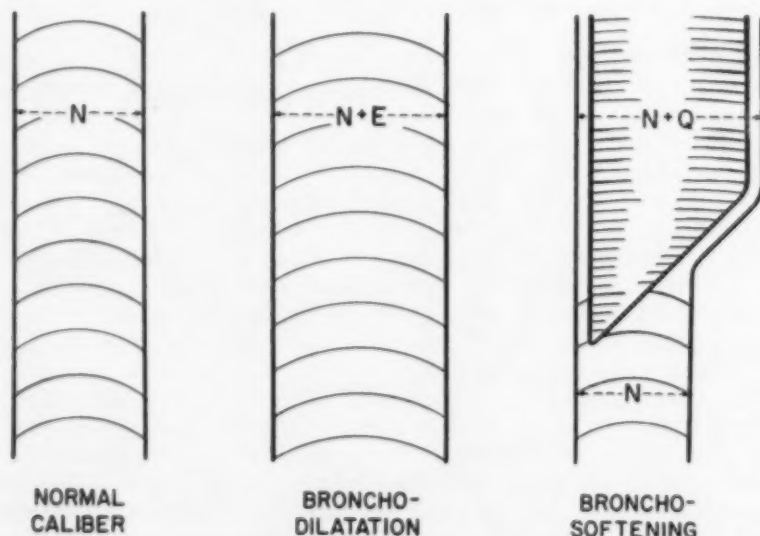


FIGURE 1: The "broncho-softening" would not be apparent without the presence of the tube in the bronchus. N = Normal. $N + E$ (epsilon, ancient Greek letter meaning a very small quantity) = Moderate expansion of the bronchus from broncho-dilating agent alone. $N + Q$ = More extensive expansion of the bronchial lumen. The bronchial wall is now more expansible when the bronchoscope is inserted and is capable of greater dilatation.

Cornet has verified for us, in the course of gastroscopies, the pyloric atony due to curare.

2. From the practical point of view—the one which interests us especially here—the same circumstances permit an *extension of the field of exploration of the bronchoscope*, revealing sometimes a lesion inaccessible with standard technique, and even allowing a biopsy otherwise impracticable.

In our first trials, the *doses of succinylcholine*, administered intravenously, varied from 5 to 30 mg. A broncho-softening effect, remarkable by its constancy and by its intensity, showed itself even in weak doses, smaller than 0.2 mg./kg. In such small doses, however, where the peripheral muscular relaxation is slight or even absent, one could still observe, in certain subjects, a short period of apnea. Although such a reaction could give no unfavorable results, it did stimulate us to seek by means of various substances (chlorpromazine, in particular), with the object of diminishing still more the dose of the active product to be injected.

At the present time, our preferences are turning to a derivative of acetanilid, lignocaine (or xylocaine), itself efficacious in small doses. Thus the mixture in the same syringe of 2 mg. of succinylcholine and 5 mg. of xylocaine (in a solution of 1 per cent) represents a uniform dosage which, introduced intravenously, obtains an undeniable broncho-softening effect, while keeping well below the apnea dose.

The curare-like compound must be ready, together with xylocaine, before starting the bronchoscopy, but held in reserve and only used when necessary. It will prove efficacious where the pre-medication has not sufficed.

We are reporting, in Table I, 30 unselected cases of endoscopic examinations done recently, which illustrate the possibilities and the limits of the means employed. One can see, as we stated at the beginning of this paper, that pre- and para-medications have overlapping indications. Thus, diethazine has broncho-softening effects; likewise it is a central sedative, but the broncho-softening effects are more marked with succinylcholine. On the other hand, the anesthetic steroid, even though it has no broncho-softening effect, acts on the striated glottal muscle and facilitates tube insertion. In this respect, its action completes, on the laryngeal level, the broncho-softening effects of curare-like compounds and of diethazine at the level of the smooth bronchial muscle. It is, besides, a powerful sedative, with hypnotic effect.

Finally, we propose the following schema for pre- and para-medication in bronchoscopy:

a) *In non-nervous subjects*

1. The injection of diethazine-atropine preceding by a quarter of an hour the beginning of:
2. Local anesthesia.
3. When necessary (for example, a difficult leftward curve, spasm, etc.) succinylcholine, in very small, non-apnea producing doses, combined with xylocaine, injected intravenously.

b) *In nervous subjects*

During the two hours which precede the bronchoscopy, an intravenous infusion of P 55 should be administered, designed solely to facilitate the tube insertion.

Following this infusion of P 55, one returns to the above schema (a): that is, the preparation by diethazine-atropine; and subsequently, when necessary, intravenous injection of a combination of succinylcholine and xylocaine in very small doses.

SUMMARY

With a view to improving the technique and, consequently, the results of bronchial endoscopy, the authors have systematically employed, as *pre-medication*, *diethazine* combined with atropine; and in some cases, an *anesthetic steroid* (P 55). A certain "broncho-softening effect" is obtained with the first drug; a tranquilizing effect, accompanied by a veritable glottal gaping, with the second.

But the broncho-softening effect is, first and foremost, linked with *para-medication*, which consists of a small dose of a synthetic curare-like compound, *diiodide of succinylcholine*, the action of which is potentiated by the addition of an equally small dose of lignocaine.

The concept of "broncho-softening" under the influence of succinylcholine, in particular, permits an extension of the field of exploration of the bronchoscope, revealing sometimes a lesion which would be inaccessible with standard technique, and even allowing an otherwise impracticable biopsy.

Addendum

Recently, we employed *Chlorpromazine* as a premedication: 25 mg., dissolved in 5 ml. of physiological saline, injected intramuscularly 20 minutes before the local anesthesia.

This drug had favorable effects: we noted its strong tranquilizing properties. Also its anti-secretive power was evident on endoscopic examination of the tracheobronchial tree, although no atropine had been given.

RESUMEN

Con la mira de mejorar la técnica y consecuentemente los resultados de endoscopia bronquial, los autores han empleado sistemáticamente la *pre-medica*ción por la *Diethazine* combinada con atropina; y en algunos casos un *esteroide anestésico* (P-55).

Cierto "efecto de ablandamiento bronquial" se obtiene con la primera droga; un afecto tranquilizador, acompañado de una verdadera relajación glótica con la segunda.

Pero el efecto de ablandamiento bronquial es primero y principalmente ligado a la *paramedicación* que consiste en una pequeña dosis de un compuesto sintético análogo al curare, *diyoduro de succinilcolina*, cuya acción es potencializada por el agregado de una dosis igualmente pequeña de lignocaína.

El concepto de "ablandamiento bronquial" bajo la influencia de la succinilcolina en particular, permite una extensión en el campo de la exploración de la broncoscopia revelando a veces una lesión que sería inaccesible

con la técnica común y permitiendo aún una biopsia de otra manera impracticable.

RESUME

En vue d'améliorer la technique et, partant, les résultats de l'endoscopie bronchique, les auteurs ont utilisé, à titre de *prémédication*, systématiquement: la *diéthazine* associée à l'atropine; éventuellement: un *stéroïde anesthésique* (le P 55). Un certain effet "broncho-émollient" est obtenu avec la première drogue; un effet apaisant, s'accompagnant d'une véritable béance glottique, avec la seconde.

Mais l'effet broncho-émollient est surtout lié à la *para-médication* qu'ils font avec de très faibles doses d'un curarisant de synthèse, le *diiodure de succinylcholine* (dont l'action est potentialisée par l'adjonction de doses également très faibles de lignocaïne).

La notion de "broncho-émollience" sous l'influence de la succinylcholine, en particulier, permet d'étendre le champ d'exploration du bronchoscope, de déceler parfois une lésion inaccessible avec la technique standard et même d'exécuter une biopsie autrement impraticable.

ZUSAMMENFASSUNG

Im Hinblick auf eine Verbesserung der Technik und damit zugleich der Ergebnisse der bronchialen Endoskopie haben die Verfasser systematisch als *Praemedikation Diethazin* in Verbindung mit Atropin angewandt und bei einigen Fällen ein anaesthesierendes Steroid (P-55). Ein gewisser "bronchuserweichender Effekt" wird mit dem erstgenannten Mittel erreicht; ein beruhigender Effekt, begleitet von einem förmlichen Klaffen der Stimmritze, mit dem zweiten.

Aber der Bronchuserweichende Effekt ist in erster Linie geknüpft an eine Paramedikation, bestehend aus einer kleinen Dosis eines synthetischen kurare-artigen Stoffes, dem Dijodid dem *Succinylcholin*, dessen Wirkung potenziert wird durch den Zusatz einer gleichfalls kleinen Dosis von Lignocain.

Die Vorstellung der "Bronchus-Erweichung" unter dem Einfluss von Succinylcholin erlaubt in besonderem eine Ausdehnung des Untersuchungsgebietes für das Bronchoskop und zeigt mitunter einen Herd, der mit der Standardtechnik unzugänglich wäre, und ermöglicht sogar eine auf andere Weise undurchführbare Biopsie.

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Pulmonary Metastasis from Occult Primary Sites Resembling Bronchogenic Carcinoma*

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During the six year period from 1950 to 1956 radiation therapy was given to almost 300 patients with thoracic lesions diagnosed as bronchogenic carcinoma. The cases fell into the following groups; explored but not resectable, resected but with involved nodes remaining, inoperable and surgery refused. Six cases³ with histologic confirmation of malignant tumor prior to radiation, which were considered to be compatible with bronchogenic carcinoma and so treated, at autopsy proved to be metastasis from a silent extrathoracic primary tumor. The clinical, radiological and pathologic considerations of these cases will be presented.

A diagnosis of metastasis to the lungs is usually accurate with solitary or multiple tumors when the primary source is known.⁵ When the pulmonary nodule is solitary and no primary source can be located the diagnosis of metastasis may be impossible without thoracotomy and histologic examination. Solitary metastasis to the lungs, and for that matter elsewhere, is not common,^{7, 22} but is known to arise from many primary tumors particularly of the kidneys. The much higher frequency of primary carcinoma of the lung in the older age groups accounts for this diagnosis being favored rather than suspecting a secondary tumor.

The lungs act as a primary filter for tumor emboli released into the systemic veins or thoracic duct and may secondarily receive tumor emboli from the portal system by way of the liver. It is not surprising that Turner and Jaffee²⁹ in reviewing a large series of metastatic lung tumors found that 50 per cent of tumors of neuromuscular and skeletal origin metastasized to the lungs as well as the same percentage of glandular and hematopoietic tumors. Of the following sites of primary tumors, 25 per cent metastasized to the lungs; urinary and male genital organs, female genital organs, gastrointestinal tract and respiratory system. Only 10 per cent of oral cavity tumors metastasized to the lungs. Generally speaking, about 30 per cent of all fatal cases of malignant tumors will have pulmonary metastases. Russo and Cavanaugh²⁶ demonstrated an increasing incidence of metastatic lung tumors after 40 years of age with the highest in the 60 year and over group. This is not unlike the age incidence of bronchogenic carcinoma.

Tumors reaching the lungs through the circulation may give rise to lesions that remain asymptomatic for varying time intervals depending upon such factors as rate of growth, number of nodules and proximity to bronchi. Eventually, there may appear symptoms of dyspnea, cough,

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sputum, weight loss, chest pain and hemoptysis. Metastasis directly through lymphatics to the hilar and mediastinal lymph nodes with subsequent bronchial compression or invasion is infrequent. Even less frequent is metastasis to the wall of the bronchus by way of the pulmonary or bronchial arteries.^{21, 33} It is in these uncommon instances that the clinical and radiographic features are indistinguishable from primary bronchogenic carcinoma. Hemoptysis, atelectasis, hilar and mediastinal lymph node enlargement occur in both conditions; even the tumor may be visible to the bronchoscopist with biopsies positive for tumor.¹⁸ Cytology studies of bronchial secretions may occasionally reveal tumor cells from a metastatic lesion. Metastatic tumor to hilar nodes may infiltrate the lung and ulcerate a bronchus as stated, while a peripheral secondary pulmonary nodule may yield metastasis to adjacent nodes³³ resulting in a radiographic appearance identical with that of bronchogenic carcinoma. There have been such occurrences in cases of carcinoma of the breast, kidney, colon and testes.²

In a significant percentage of cases the pathologist while recognizing that a malignant tumor exists will be unable to state the tissue of origin from the study of biopsy sections.¹⁹ This may be due to the anaplasia of the secondary tumors and the not infrequent variations of the histologic appearance in different parts of a tumor. The limited biopsy specimen may not be sufficiently representative of the tumor as a whole. Furthermore, congestion, inflammation and necrosis may also modify the histologic appearance of the tumor so that even a thorough study of the complete surgical specimen may not permit a definite diagnosis.³³ Kirklin and his associates²² in a restudy of the cell types in 844 cases of bronchogenic

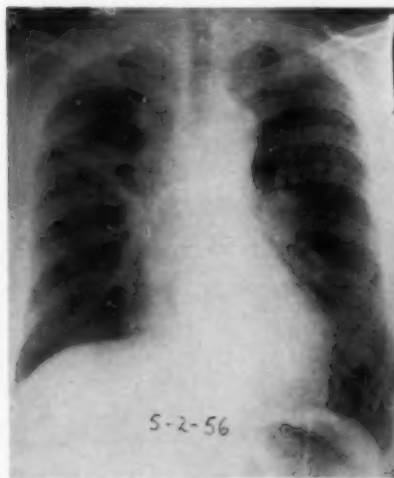


FIGURE 1



FIGURE 2

Figure 1 (Case 1): Primary tumor in pancreas. Mass in right hilum and right superior mediastinum with contraction of right upper lobe.—*Figure 2* (Case 1): Marked tumor regression one month after radiation therapy.

carcinoma noted the difficulty in differentiating some adenocarcinomas of the lung from metastatic tumors. This was also the experience of Russo and Cavanaugh.²⁶

There have been a number of case reports of lung lesions appearing to be bronchogenic carcinoma but which proved to be metastatic from primary tumors removed surgically up to 20 or more years previously.^{4, 6, 8, 9, 11, 12, 14, 23, 25, 27, 28, 30} Such primary lesions have included carcinomas of the kidney, colon, thyroid, breast, uterus and ovary, sarcoma of bone, melanoma of skin, testicular tumors and fibrosarcoma. Current opinion favors the resection of solitary lung nodules even if a secondary tumor were suspected⁵ because of a history of a previous primary tumor. The solitary nodule may prove to be a benign tumor, granuloma, or even a new primary malignancy in the lung.

We now come to the consideration of lung lesions which resemble bronchogenic carcinoma without a history of a previously resected malignant tumor and which later proved to be metastasis from a clinically silent extrathoracic primary site. A limited search of the literature produced 14 well documented cases^{1, 13, 17, 20, 21, 24, 31, 32, 34} which fell into this group but in only six was the primary site named. They were as follows, kidney, two cases; pancreas, stomach, testes, gallbladder, 1 case each and primary site not stated, eight cases. The present report adds six additional cases—pancreas, three, prostate, two, and kidney, one.

Case Reports

Case 1: L. R. J. Primary Tumor in Pancreas. This 64 year old white man had cough, weight loss and superior mediastinal obstruction. Chest film (Fig. 1) revealed elevation of right diaphragm, right superior mediastinal mass and right upper lobe contraction.



FIGURE 3



FIGURE 4

Figure 3 (Case 2): Primary tumor in pancreas. Lobulated right hilar mass with adjacent peripheral mass prior to thoracotomy.—Figure 4 (Case 2): Regression of right lung masses after radiation therapy. Pleural reaction at right base related to surgery.

Bronchoscopy demonstrated corrugated appearance of right upper lobe bronchus but biopsy was negative. Right supraclavicular node biopsy reported as anaplastic carcinoma, possibly adenocarcinoma. He received radiation therapy for 6647r tumor dose in 31 days with no change in x-ray film appearance at completion of therapy, but marked symptomatic improvement. A month after therapy (Fig. 2) there was evidence of some tumor regression. He died five months from beginning of radiation.

Autopsy revealed tumor in hilar and mediastinal nodes compressing trachea, esophagus and superior vena cava. The right upper lobe bronchus was compressed by a 4 cm. mass. Microscopic examination demonstrated invasion of the bronchus by tumor. A 3 x 4 cm. mass was found in the tail of the pancreas. The final diagnosis was adenocarcinoma of the pancreas with metastasis to lungs, lymph nodes and elsewhere.

Case 2: S. S. Primary Tumor in Pancreas. This 56 year old man was admitted for investigation of a chest lesion discovered by a mobile chest unit. All studies including a gastrointestinal series and sputa were negative. A chest roentgenogram (Fig. 3) prior to thoracotomy demonstrated a lobulated right hilar mass with an adjacent parenchymal nodule. At surgery the lesion was considered non-resectable because of involved mediastinal nodes. One node removed for biopsy was reported as anaplastic metastatic tumor probably from bronchogenic carcinoma.

He received radiation therapy for a tumor dose of 6646r in 34 days. When treatment was finished (Fig. 4) there was almost complete tumor regression.

He got along well for nine months when he was readmitted with signs of myocardial infarction. He died June 9, 1954, one year from beginning of radiation. Autopsy revealed no evidence of tumor in either lung. The body and tail of the pancreas was completely replaced by tumor and contained a 5 cm. pseudocyst. The diagnosis was carcinoma of pancreas with metastasis to liver and abdominal lymph nodes.

Case 3: C. I. C. Primary Tumor in Pancreas. This 47 year old white man was admitted with left chest pain and cough. He had subtotal gastric resection for chronic duodenal ulcer three years previously. A chest roentgenogram revealed a left hilum mass with infiltration and atelectasis of left lower lobe (Fig. 5). On bronchoscopy an endobronchial lesion was found but biopsy was negative for tumor. A gastrointestinal series revealed the gastroenterostomy to be functioning normally. Sputum studies were negative.

He was referred for radiation therapy without an established diagnosis but clinically considered as inoperable bronchogenic carcinoma. After a tumor dose of 6000r in 40 days there was complete clearing of the left lung lesions (Fig. 6). The left lung in-

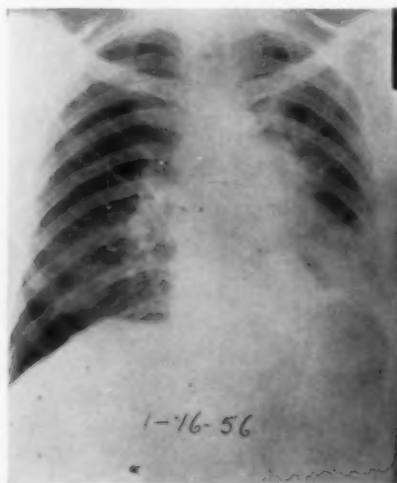


FIGURE 5

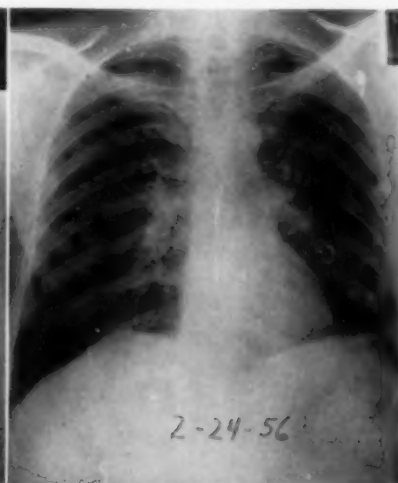


FIGURE 6

Figure 5 (Case 3): Primary tumor in pancreas. Left hilum mass with lower lobe atelectasis and pneumonitis.—Figure 6 (Case 3): Regression of hilum mass and re-aeration of left lower lobe after radiation therapy.

filtrations subsequently recurred with the development of a lung abscess. He died four months after beginning of radiation.

Autopsy demonstrated a large left lower lobe abscess, an 8 x 10 cm. mass in the left upper quadrant of the abdomen with extension to the adjacent stomach, colon and kidney. The mass replaced the tail of the pancreas. The final diagnosis was anaplastic carcinoma of the tail of the pancreas with extension to neighboring organs and metastases to left lung and elsewhere.

Case 4: W. S. Primary Tumor in Prostate. This 57 year old colored man had progressive dysphagia, epigastric pain and weight loss. A chest roentgenogram revealed a large mediastinal mass and a right lung peripheral nodule. Bronchoscopy revealed a mass in the right main stem bronchus. Biopsy was reported as oat-cell bronchogenic carcinoma.

He was referred for radiation therapy. Chest x-ray film (Fig. 7) showed a large mediastinal mass bulging into the right hilum region and a right lung nodule at the level of the fifth anterior rib. He received a tumor dose of 3135r in 20 days without effect. Treatment was interrupted because of his rapidly deteriorating condition. He died one month from beginning of radiation.

Autopsy revealed a mass involving the right hilum and mediastinum. The mass surrounded the right main bronchus and demonstrated on histologic section that tumor extended to the mucosa (Fig. 8). The prostate revealed a 2.5 cm. nodule adjacent to the symphysis. On cut section the prostate was almost entirely replaced by tumor. The final diagnosis was carcinoma of the prostate with metastasis to lung, lymph nodes and elsewhere.

Case 5: J. H. P. Primary Tumor in Prostate. A 56 year old white man was found to have a peripheral pulmonary nodule (Fig. 9) at an admission for a herniorrhaphy. He refused thoracotomy at first but accepted it five months later.

The right upper lobe lesion became slightly larger during this interval. At thoracotomy a right upper lobe mass was confirmed but because of tumor in hilar nodes, identified on frozen section, no resection was done. He was given radiation therapy for a tumor dose of 6000r in 42 days with some decrease in size of the mass. His course was slowly downhill with death occurring 18 months after beginning of radiation.

Autopsy demonstrated bilateral metastatic pulmonary tumor nodules; no endobronchial tumor could be identified. The prostate was grossly normal but histologic examination revealed carcinoma. The final diagnosis was carcinoma of the prostate with metastasis to nodes, lungs and elsewhere.

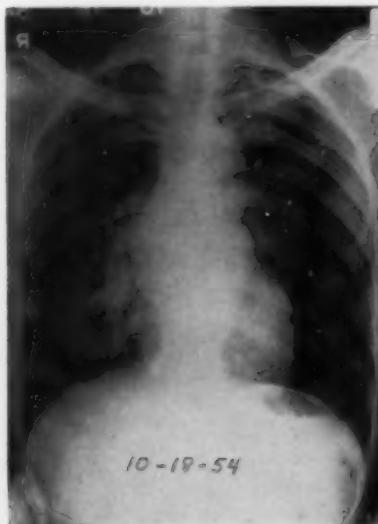


FIGURE 7

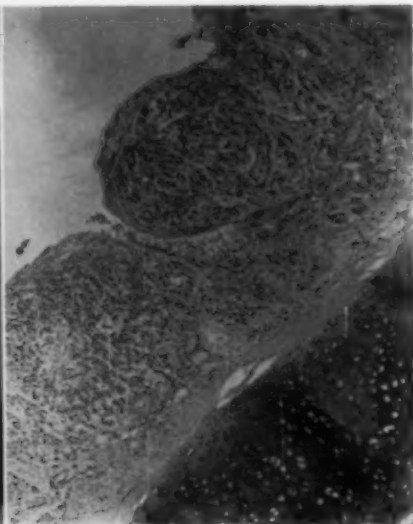


FIGURE 8

Figure 7 (Case 4): Primary tumor in prostate. Mediastinal and right hilal mass as well as a peripheral nodule at the level of the right 5th anterior rib.—Figure 8 (Case 4): Histologic section of bronchus demonstrating extensive tumor invasion of sub-mucosa.

Case 6: J. L. R. Primary Tumor in Kidney. This 34 year old colored male was admitted October 27, 1955 with an acute respiratory infection. He had had frequent such episodes for the past eight years. Chest roentgenogram on admission (Fig. 10) demonstrated cystic disease involving the upper half of the right lung and left apex. Several fluid levels are noted within the cysts. He became symptom free with antibiotics. Sputum cultures were negative for tubercle bacilli and fungi. Urinalysis was negative. Film two months later (Fig. 11) showed a nodular density near upper part of the right hilum and apex of right lung with a fluid level in the apex. A clinical diagnosis of infected cystic disease with possible neoplasm was made and right upper lobectomy was done January 16, 1956. The surgical specimen showed multiple cysts with the apical cyst containing a 5 cm. mass. Histological examination demonstrated granulomatous tissue as well as anaplastic carcinoma. The diagnosis was bronchogenic carcinoma and granulomatous disease.

He received radiation post-operatively for a tumor dose of 6615r in 30 days. He was readmitted three months after radiation with cough and bilateral lung nodules revealed on x-ray film. Urinalysis was negative at first on this admission but later showed microscopic hematuria. An intravenous pyelogram showed failure of filling of left lower and middle calyces consistent with renal tumor.

He died five months from beginning of radiation. Autopsy showed the left kidney almost replaced by tumor. The final diagnosis was carcinoma of kidney with metastasis to liver and lungs.

Comments

Pancreatic carcinoma commonly spreads to regional nodes and to the liver. Blood-borne metastasis occurs in 20 per cent of fatal cases.³³ Diagnosis of carcinoma of the tail of the pancreas is rarely made prior to laparotomy or autopsy and would escape detection in the absence of symptoms.

Carcinoma of the prostate showed an incidence of pulmonary metastasis of 38 per cent in cases coming to autopsy,¹⁰ but only 8.6 per cent showed x-ray film evidence of secondary lung tumors.¹⁶ This indicates that detectable lung metastasis in carcinoma of the prostate is usually a late, near terminal, manifestation. Russo and Cavanaugh²⁶ found no case of metastasis to the lungs from carcinoma of the prostate in their study of 105 metastatic lung lesions.

Lung metastasis is frequent from carcinoma of the kidney, as high as 75 per cent in fatal cases.³³ This high incidence is to be expected since metastasis in usually by way of the blood stream. Occasionally, mediastinal and hilar nodes may be involved. The tendency for solitary lung metastasis from carcinoma of the kidney is well known and prompts early investigation of the kidneys. Carcinomas of the kidney, even though clinically silent, are therefore often detected when the distant metastasis in the lung is the presenting sign.³

It is not to be implied that unduly prolonged periods of observations or investigations are recommended in order to exclude the possibility of metastatic tumor arising from a clinically silent extrathoracic primary tumor. It has been frequently demonstrated that routine investigations of systems and organs in the absence of symptoms or signs give low returns. The safety of thoracotomy recommends it as a therapeutic and diagnostic procedure. Should this not be feasible, radiation therapy should be carried out as a palliative alternative, although admittedly of uncertain benefit.

Radiation therapy was carried out in the six reported cases with G.E. 1000 KV HVL 3.7 Pb, 3 MA at 70 cm. distance. The treatment plan

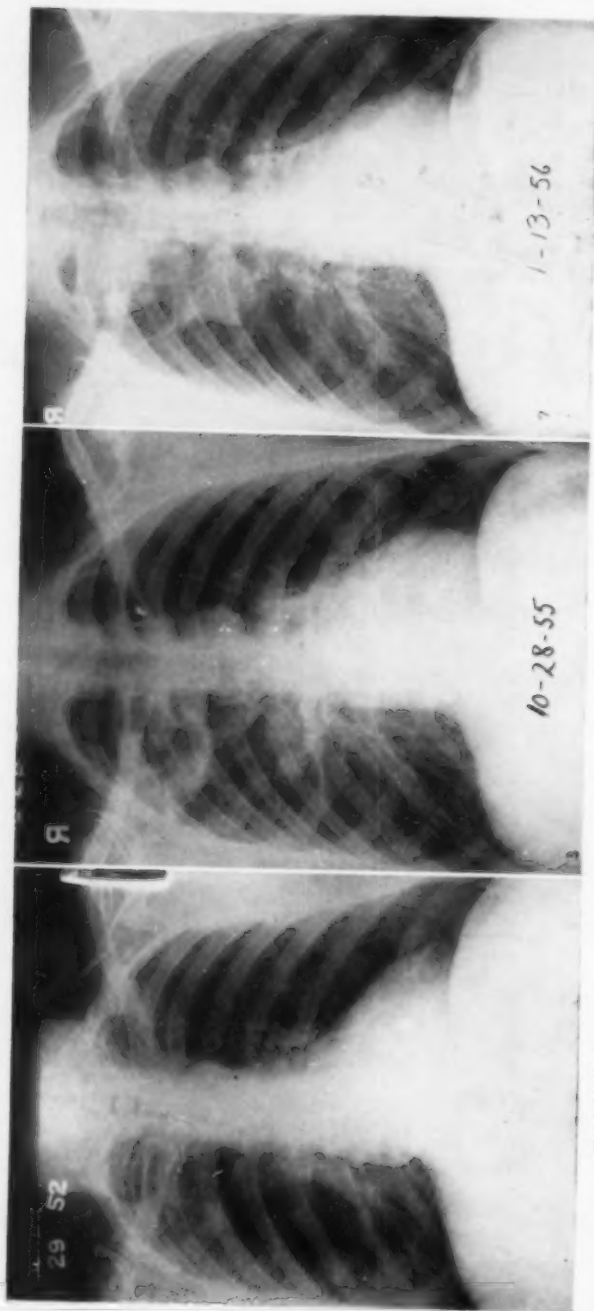


FIGURE 9

Figure 9 (Case 5): Primary tumor in prostate. Asymptomatic right upper lung solitary nodule.—*Figure 10* (Case 6): Primary tumor in kidney. Multiple cysts in right lung with fluid levels. Appearance on admission.—*Figure 11* (Case 6): Nodular densities in right upper lobe with fluid level in apex. Prior to right upper lobectomy.

FIGURE 10

FIGURE 11

consisted of the use of multiple converging fields aiming to deliver the equivalent of 6500r to the tumor in 30 days, as is our practice for bronchogenic carcinoma. Only in Case 4 was the dose substantially below this level. In Case 2 radiation caused complete regression of the lung masses and the patient survived a year from beginning of radiation. In the other five cases radiation therapy was of little or no benefit.

SUMMARY

Six cases of metastatic lung disease from occult primary sites, later proved to be in the pancreas, prostate and kidney, have been presented with the clinical, radiological and pathological features indistinguishable from bronchogenic carcinoma. Early diagnosis of such cases may not be possible.

Surgical exploration, if feasible, is the treatment of choice in pulmonary masses. Radiation therapy for palliation is recommended if malignancy is established or clinically diagnosed and surgery contra-indicated.

Extensive and prolonged diagnostic studies in order to prove the existence of a silent primary site is not in the patient's interest. Examination of the commonly reported sites, such as the genito-urinary and gastrointestinal tracts, could be carried out in a short period of time although frequently they fail to reveal the pathology.

RESUME

L'auteur présente six cas de cancer métastatique du poumon dont le foyer primitif n'a pu être mis en évidence et a été montré ultérieurement localisé au pancréas, à la prostate et au rein. Ces localisations pulmonaires avaient des caractères cliniques, radiologiques et pathologiques impossibles à différencier de ceux du cancer bronchique primitif. Le diagnostic précoce de tels cas peut ne pas être possible.

L'exploration chirurgicale, si elle est réalisable, est le traitement de choix des tumeurs pulmonaires. La radiothérapie, comme traitement palliatif, est recommandée si l'existence du cancer est établie ou soupçonnée cliniquement, et si la chirurgie est contre-indiquée.

Des études diagnostiques complètes et prolongées pour essayer de mettre en évidence l'existence d'une localisation primitive latente ne sont pas dans l'intérêt du malade. L'examen des localisations les plus habituelles, telles que celles des systèmes génito-urinaires et gastrointestinaux, pourrait être pratiqué en un court laps de temps, bien que fréquemment les examens anatomo-pathologiques ne peuvent être réalisés.

RESUMEN

Se presentan seis casos de metástasis pulmonares a partir de primarios ocultos que después se aclaró radicaban en páncreas, próstata y riñones, con las características clínicas, radiológicas y patológicas indistinguibles del carcinoma bronquiogénico.

El diagnóstico temprano de tales casos puede no ser posible. Si es factible, la exploración quirúrgica es el tratamiento de elección en las

masas pulmonares. Se recomienda la radioterapia paliativa si aclara la malignidad y la cirugía está contraindicada.

Los estudios extensos y prolongados para demostrar la existencia de un tumor primario silencioso no corresponde al interés del enfermo.

El examen de los lugares más habitualmente afectados como las vías genitourinarias, la gastrointestinal, pueden realizarse en corto tiempo si bien frecuentemente no revelan la patología.

ZUSAMMENFASSUNG

Vorweisung von 6 Fällen von metastatischer Lungenerkrankung bei verborgenem Primärherd, der sich später als im Pankreas, in der Prostata und Niere lokalisiert erwies, und zwar anhand der klinischen, röntgenologischen und pathologisch-anatomischen Merkmale nicht zu unterscheiden vom Bronchialcarcinom. Die Früh-Diagnose solcher Fälle kann unmöglich sein.

Untersuchung auf chirurgischem Wege, falls sie sich durchführen lässt, ist die Behandlung der Wahl bei pulmonalen Verdichtungen. Palliative Strahlenbehandlung wird empfohlen, wenn die Bösartigkeit sicher gestellt oder klinisch diagnostiziert und chirurgisches Vorgehen kontraindiziert ist. Intensive und langdauernde diagnostische Untersuchungen mit dem Ziel, das Bestehen eines stummen Primärherdes nachzuweisen, liegt nicht im Interesse des Kranken. Untersuchung der für gewöhnlich angegebenen Lokalisation, also des Urogenitaltraktes und des Magen-Darmkanales lassen sich in kurzer Zeit ausführen, obwohl sie häufig darin versagen, die krankhaften Umstände aufzudecken.

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Study in the Therapy of Transverse Myelitis Occurring During Tuberculous Meningitis

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Transverse myelitis appearing during the course of tuberculous meningitis is one of the main reasons for its poor prognosis. Fortunately, this condition is relatively infrequent and, it is possible with prompt and appropriate therapy it can be significantly reduced.

Spreading of the infection in the medulla spinalis is mainly due to contamination of the meninges during tuberculous meningitis. Localization of *Mycobacterium tuberculosis* in the medullar substance through the circulation in generalized tuberculosis is uncommon.

In the international literature, only a few cases of tuberculous meningo-myelitis are reported. Kupka and his collaborator, Harbitz, Kreschner and his collaborator, and Rigton, have presented a number of cases.

Fischer reported 20 cases of myelitis in the course of tuberculous spondylitis caused by compression of vertebrae and cold abscess formation.

At Sotiria Sanatorium, in our clinic, we treated 209 cases of tuberculous meningitis and observed only six cases of transverse myelitis, which appeared in the course of tuberculous meningitis insufficiently treated at places other than our institution. Three of them died, and necropsies were performed.*

Report of Cases

We consider essential the detailed presentation of cases in order to render our conclusions clearer.

Case 1: D. M., a man clerk, aged 27, was found to have pulmonary tuberculosis in August 1952. Biochemical treatment for eight months was insufficient. In 1952, he had tuberculous meningitis and for 55 days he was treated insufficiently in his house. Treatment there consisted of intraspinal injections of streptomycin combined with small doses of INH. In March 1953, he was transferred to our clinic. He had a high fever, dimness of mental functions, spasms with hyperexcitability and all the clinical symptoms of meningitis. Laboratory examination of cerebrospinal fluid showed 650 cells per cc., 96 per cent being lymphocytes and 2.5 gr./100 cc. of protein and *Mycobacterium tuberculosis*.

Other findings were rectovesical disturbances, spastic paresis of the lower extremities with heightened tendon reflexes, disturbance of sensitivity and extensive necrotic changes of the gluteal and sacrolumbar skin regions. Thus, it was as a meningo-myelitis case.

Intraspinal streptomycin was discontinued and followed by persistent antituberculous drug therapy. Improvement of meningitis was marked. The cerebrospinal cell count fluid and protein decreased. The medullar symptoms, however, were accentuated, the spastic paresis turned flaccid, the retentions of urine and feces increased, as well as the skin necroses. The patient's condition progressively became worse and four months later he died.

On post-mortem examination the brain was edematous, the cerebral ventricles dilated and filled with turbid cerebrospinal fluid; in the base of the brain a considerable amount of viscous and glutinous exudate was found; the spinal meninges were much thickened and in places, small pockets of fluid adhered; in the thoracic region of the spinal column, a good sized pocket of fluid was found where the pia mater firmly

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*The histology examinations were made by Professor D. Eleftheriou to whom we extend our thanks.

adhered to the spinal cord. Transverse dissection at this very point showed complete transverse degeneration with necroses, and it was impossible to distinguish between the white and grey matter. Histological study revealed, in addition to necrotic and degenerative substances which occupied all the transverse segment of the cord, peripheral necrosis like a geographical map. In the destructive changes of medullar substance, scattered tubercles were found. The walls of the vessels of the subarachnoid cavity were infiltrated and many of them were completely plugged. The vessels of the spinal meninges showed periadventitial infiltrations with many tubercles.

We concluded that it was a case of diffuse transverse myelitis involving the thoracic region of the spinal cord, caused by bacilli localization in the medullar substance from contiguous tissues. In this case, the accentuation of the disease and the diffuse destruction of the transverse medullar segment was due to the progressive compression of the spinal cord by the encysted pocket of fluid. This pocket formation was due to the adherent meninges.

Case 2: S. D. This man, a laborer aged 32, reported having pulmonary tuberculosis in March 1952. In March 1953, he had tuberculous meningitis and was hospitalized. For three months, the treatment consisted of intraspinal injections of streptomycin and small doses of INH. In June 1953, he was transferred to our clinic, when he had fever, opisthotonos, and total mental dimness. Cerebrospinal fluid examination showed 770 cells per cc. and 16 gr./100 cc. of protein. Spastic paresis of the lower extremities, positive Babinski plantar reflex, foot clonus, exaggerated reflexes, and hyperthesia were also present. Other findings were rectovesical disturbances, e.g., alternate retention and loss of rectal and vesical control.

Although the intraspinal injections of streptomycin were discontinued and large doses of INH and PAS were intravenously administered, he became worse. A month and a half later, spastic paresis turned flaccid, extensive nutritional disorders of the skin appeared, and loss of rectal and vesical control occurred. His condition gradually became worse, and in the fourth month following hospitalization he died.

Post-mortem findings revealed marked increase of cerebrospinal fluid with edematous encephalic substance. The spinal meninges were thickened and at places adherent to themselves and the medulla spinalis. In certain points between the meninges small pockets of turbid fluid were found; dissection at the adherent points of the medullar substance and the pia mater showed degenerative changes and necroses of the whole transverse segment; the histological findings showed degenerative necrotic destruction of the medullar substance with small, sparse tubercles; infiltrations and thromboses of the vessels of the subarachnoid cavity and extensive degenerative changes of the spinal meninges were also found. We concluded that this was a case of diffuse transverse myelitis with multiple foci in the medullar substance.

Case 3: I. D., male. This farmer, aged 45, had pulmonary tuberculosis five years ago. In April 1953, he had tuberculous meningitis and entered a hospital. Treatment consisted of intraspinal injections of streptomycin, PAS, and INH. The second month following the intraspinal injection therapy, although he showed slight clinical improvement, medullar phenomena appeared. He was admitted to our clinic. His condition was grave. Besides meningitis symptoms and the findings in the cerebrospinal fluid, he also had flaccid paralysis of the lower extremities, loss of rectal and vesical control, and extensive skin necroses.

Intraspinal injections were discontinued and usual chemotherapy followed. His condition, however, progressively became worse and in two months, that is five months following the infection, he died. Microscopic study revealed multiple diffuse transverse spinal destruction in different levels. Small tubercles in the medullar substance were also seen. Extensive adherent processes of the spinal meninges, accompanied by periadventitial infiltrations and a plugging of the vessels, were also seen. We concluded that it was a tuberculous meningomyelitis case with multiple medullar foci.

Case 4: P. E. This laborer aged 21 had acute miliary tuberculosis in March 1952. Two years later, tuberculous meningitis was present. He was treated insufficiently with intraspinal injections of streptomycin, PAS, and INH. After two months of therapy, he also had symptoms of meningomyelitis.

He was transferred to our clinic with meningitis symptoms; abundant cerebrospinal fluid findings, spastic paresis of the lower extremities, exaggerated reflexes, positive Babinski's sign, foot clonus, nutritional skin disorders and rectovesical disorders.

Intraspinal injections were immediately discontinued and usual chemotherapy was initiated, supplemented by 12 mgs. per Kg. body weight of Sulfone J.51, daily.

Ten days later his condition improved considerably and within 45 days, all meningitis symptoms had disappeared. Medullar symptoms were also improving. Four and a half months later, almost all spinal symptoms had disappeared to the point that he could move freely. A slight spastic gait was the sole effect of the disease, which with electrotherapy and massage was improved to the extent that he was discharged as clinically cured. A year later, he was in excellent condition, exhibiting only a slight spastic gait.

We conclude in this case that the J.51 addition in meningomyelitis treatment contributed to the cure of the disease, leaving few residuals.

Case 5: S. I. This man a clerk aged 26, was hospitalized for tuberculous meningitis in February 1952. He was treated insufficiently with intraspinal injections of streptomycin and INH. In May 1954, he had a new paroxysm of meningitis and was brought to our clinic. He also had transverse myelitis symptoms affecting the lumbar region of the spinal cord. The cessation of intraspinal injections was followed by intravenous administration of INH, PAS, and sulfone J.51, 14 mg. per Kg. body weight. After four months of treatment the meningitis symptoms disappeared altogether, the cerebrospinal fluid was normal, and the myelitis symptoms showed improvement. The rectovesical and nutritional disorders of the skin disappeared. Sensitivity became normal, and the spastic paresis of the extremities improved.

Eight months after this therapy was started, he was clinically cured except for a slight spastic walk, which was treated with electrotherapy, massage, and vitamin B, besides the other medication. He was dismissed in excellent condition.

Case 6: G. L. This man a student aged 22, had exudative pleurisy in March 1955. Eight months later, he was treated for tuberculous meningitis in a State hospital. The three-month treatment consisted of intraspinal injections of streptomycin and small amounts of PAS and INH with no evident improvement. Moreover, he had rectovesical disorders and spastic paresis of the extremities. When admitted to our clinic he had chronic tuberculous meningitis and transverse myelitis. Discontinuation of intraspinal injections was followed by large doses of INH, PAS, and sulfone J.51 in doses of 14 mg. per Kg. body weight. This treatment was continued for six months. The meningitis symptoms disappeared, the cerebrospinal fluid became normal and urine and feces retentions as well as skin abnormalities disappeared. The spastic paresis of the extremities improved. After eight months, he was dismissed as chronically cured with only a slight spastic walk residual.

Comment

Myelitis, depending on the total or partial damage of the transverse segment of the cord, is distinguished as diffuse or disseminated respectively. According to its duration, it is designated as acute, subacute, or chronic. Symptomatology depends upon type and extent of damage to the medullar substance. In acute myelitis symptoms appear at once and consist of total disappearance of mobility, anesthesia, as well as loss of reflexes caudal to the damage, consequent of which is flaccid paralysis of the lower extremities, vesica urinaria, and rectum, and extensive nutritional disturbances of the skin in the form of necroses also appear. On the other hand, the symptomatology of subacute or chronic myelitis is different and appears gradually. The reflexes do not disappear, muscle tone remains, rectovesical disorders alternately improve or grow worse. The nutritional disturbances of the integument appear gradually and are localized, Babinski's sign and foot conus appear early, and areas inferior to the damage have normal sensation.

The first three of our cases were diffuse transverse myelitis, as destruction involved the whole segment of the cord. In the last three subacute disseminated cases, the lesions, because of the intense therapeutic administration and especially because of the addition of sulfone J.51, not only did not extend but were even inhibited and gradually healed, leaving slight after effects in the motor region of the cord.

Through detailed tests of the reaction and sensitivity of the skin from the inferior towards the superior layer, we found that in the first case of transverse myelitis the thoracic region of the column was affected. In the second and third cases the myelitis was located in the thoracolumbar and sacral regions respectively. Morbid anatomy verified our findings. In the remaining three cases, we proved clinically that the damage was

in the lumbar region and that the destruction was disseminated. Necropsy also revealed that the destruction in the first three cases was diffuse. In the first case, in addition to necrotic and degenerative changes of the white and grey substance, sparse tubercles were also found. The walls of the vessels of the subarachnoid cavity were infiltrated and plugged. At the points where there were destructive changes in the medulla the pia mater was firmly adherent to the medulla spinalis. Between the two meninges there was a pocket of turbid fluid, the walls being the adhesions of the two meninges.

From the above, one may conclude that the infection of the medullar substance was caused by direct extension, and the peripheral necroses were due to a plugging of the vessels. The total damage of the transverse segment was caused not only because of the tuberculous localization but mainly from the gradual compression of the medullar segment by the encysted pocket of fluid.

In the second and third cases, besides total transverse destruction in different levels of the cord, we also found a complete adherent process of the meninges, as well as multiple tiny pockets of turbid cerebrospinal fluid, in the whole of the vertebral canal.

It is known that such localized or extended medullar necroses are also caused by cancer, syphilis, and arteriosclerosis. The differential diagnosis, however, is based on laboratory, clinical and x-ray findings.

In the remaining three cases, the cessation of intraspinal injections was followed by persistent biochemical therapy with large intravenous doses of INH and PAS and, in addition, doses of 12-14 mg. per Kg. body weight of sulfone J.51. As a result, the subacute disseminated transverse myelitis showed no tendency to grow worse, but on the contrary the symptoms gradually disappeared and the patients were finally discharged as clinically cured with only slight effects from the motor region of the spinal cord. For over a year, the patients are seen regularly and their condition is excellent.

In all our cases of tuberculous meningomyelitis, prolonged therapy of intraspinal injections of streptomycin had preceded. We believe that this point is of considerable importance.

As was reported in a previous study that streptomycin injected intraspinally causes intensive stimulation of the meninges. This is proved by the fact that following intraspinal injections a considerable increase of cells in the spinal fluid is noted, accompanied by paroxysms with meningeal symptoms. In certain cases during intraspinal administration of streptomycin and during the period of improvement, we observed that the disease grew worse. We interpreted this as recurrence. However, the paroxysms disappeared as soon as the intraspinal injections of streptomycin were discontinued. The intensive stimulation of the meninges by streptomycin and the daily injury from the needle contributed to the formation of adherent processes and their disagreeable consequences. In all of the dissected cases in which intraspinal injections had been given, extensive adhesions of the meninges with encysted pocket forma-

tions filled with cerebrospinal fluid with corresponding medullary destruction was a constant finding. The paroxysm of the meninges, inflammation, and the adhesion process contribute to the expansion of contamination in the medullary substance and the destruction of the vessels of the subarachnoid cavity, resulting in deficient blood supply to the medullary substance and consequently a degeneration and necroses of the corresponding medullary segments.

Having this in mind, we have for some years omitted intraspinal injections of streptomycin, and since then, have never observed a case of meningomyelitis.

Special attention should be drawn to the fact that in three out of six cases in which, in addition to antituberculosis drugs, we also administered J.51, we succeeded in preventing further meningomyelitis developments and in bringing about an almost complete cure. We have used J.51 (Sulfone thymole) for three years in our clinic at Sotiria Sanatorium.^{6,7} The results were excellent, especially in the treatment of tuberculous meningitis, since 96.7 per cent of the patients recovered completely. They are still immune after long treatment and by treatment in large dosages. The effectiveness and immunization is confirmed by other authors. Furthermore, the advantage of J.51 is that it retards the occurrence of streptomycin resistance.

We cannot yet give an explanation for the way J.51 acts in the treatment of tuberculous meningitis and myelitis. All our attempts to trace the drug in the cerebrospinal fluid, blood, and urine have failed. A good number of investigators feel that J.51 *in vivo* breaks up and great amounts of it diffuse in pathologic tissue where it stays for a long time coming in constant contact with the pathologic agent. The foregoing conception, however, does not have a laboratory basis. Undoubtedly, however, J.51 has a valuable therapeutic effect in tuberculous meningitis and myelitis.

CONCLUSIONS

1. In a considerable number of cases of tuberculous meningitis, transverse myelitis may occur and localization of bacilli in the medulla spinalis is primarily due to direct extension.
2. Myelitis appears in cases of prolonged and incomplete therapy of tuberculous meningitis and mainly when intraspinal injections of streptomycin have been administered for a long time.
3. Sulfone J.51 has a considerable therapeutic effect on meningomyelitis, and especially when administered before complete degeneration and necrosis of a spinal segment.
4. Histologic changes of myelitis consist of degenerative and necrotic changes of white and grey matter, accompanied by development of tubercles as well as extensive changes in the subarachnoid cavity vessels.

CONCLUSIONES

1. En un número considerable de casos de meningitis tuberculosa puede ocurrir la mielitis transversa y localización de bacilos en la médula, se debe en primer lugar a retención.

2. La mielitis aparece en casos de terapéutica prolongada e incompleta de la meningitis tuberculosa y principalmente cuando se han hecho inyecciones intraespinales de estreptomycin por largo tiempo.

3. La sulfona J.51 tiene un efecto terapéutico considerable en la meningo-mielitis y especialmente cuando se administra antes de la degeneración y necrosis de un segmento espinal.

4. Los cambios histológicos de la mielitis consisten en degeneración y necrosis de las substancias blanca y gris acompañadas de desarrollo de tubérculos así como extensos cambios en los vasos del espacio subaracnoideo.

RESUME

1. Dans un grand nombre de cas de méningite tuberculeuse, une myélite transverse peut survenir, et la localisation des bacilles dans la moelle épinière est due en premier lieu à la rétention directe.

2. La myélite apparaît dans les cas de traitement prolongé et incomplet de méningite tuberculeuse, et principalement lorsque injections intrarachidiennes de streptomycine ont été administrées pendant longtemps.

3. La sulfone J.51 a un effet thérapeutique considérable sur la méningomyélite, et surtout lorsqu'elle est administrée avant la dégénérescence complète et la nécrose d'un segment médullaire.

4. Les altérations histologiques de myélite consistent en altérations dégénératives et nécrotiques de la matière grise et de la matière blanche, associées à l'apparition de tubercules ainsi que d'altérations extensives dans des vaisseaux de la cavité sous-arachnoïdienne.

SCHLUSSFOLGERUNGEN

1. In einer beträchtlichen Zahl von Fällen von tuberkulöse Meningitis kannte eine Querschnitts-Myelitis auftreten, und die Lokalisation von Bazillen in der medulla spinalis ist in erster Linie die Folge direkter Retention.

2. Die Myelitis tritt auf in Fällen von langdauernder und unvollständiger Therapie der tuberkulösen Meningitis und hauptsächlich, wenn von intralumbalen Streptomycin-Injektionen lange Zeit hindurch Gebrauch gemacht wurde.

3. Die Schwefelverbindung J51 übt einen beträchtlichen therapeutischen Effekt aus auf die Meningomyelitis, besonders bei Anwendung von kompletter Degeneration und Nekrose eines spinalen Segmentes.

4. Die histologischen Veränderungen der Myelitis bestehen in degenerativen und nekrotischen Veränderungen der weissen und grauen Substanz in Verbindung sowohl von Tuberkeln als auch ausgedehnten Veränderungen an den Gefäßen des Subarachnoidalraumes.

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SECTION ON CARDIOVASCULAR DISEASES

Differentiation of the Causes of Pulmonary Hypertension in Rheumatic Heart Disease by Simultaneous Right and Left Heart Catheterization*,**

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Pulmonary hypertension in patients with rheumatic heart disease is induced by pulmonary vascular disease, mitral valve block, left heart failure or any combination of these entities.^{1,2} Exact differentiation between these various possibilities is difficult on clinical grounds or with the aid of right heart catheterization. The purpose of this report is to demonstrate how combined and left heart catheterization can facilitate solution of this problem and shed light on the clinical and physiologic abnormalities in mitral and/or aortic valve disease.

Methods

Right heart catheterization and arterial cannulation are performed via the same arm in the usual manner in the basal post-absorptive state to permit determination of the cardiac output by the Fick principle. Multiple steady rate pressure and cardiac output determinations are made at rest, and during exercise and recovery. Whenever possible, double-lumen or triple-lumen catheters are used to permit simultaneous pressure recording from multiple sites in the right heart and pulmonary artery. With the right heart catheter and brachial artery needle in situ, the patient is turned to the prone position. Repeat right heart pressures are obtained. Meperidine Hydrochloride (50-75 mg.) is given intramuscularly at this point.

Left heart catheterization is performed by a modification of the posterior percutaneous puncture technique of Fisher.³ Fluoroscopic visualization of the left atrium is performed in the prone position. Two six or seven

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inch No. 17 thin-walled styletted needles are inserted into the left atrium. Polyethylene tubing is then passed through these needles into the left atrium and left ventricle. Simultaneous pressures are obtained (from the same baseline and at identical strain gauge sensitivities⁴) from the left atrium, left ventricle and brachial artery in the prone position.

Whenever possible, the left heart needles are removed at this point in a fashion such that the polyethylene catheters remain in the left atrium and left ventricle respectively. The patient is carefully returned to the supine position. These positional changes are facilitated by the prior insertion of the brachial artery needle and right heart catheter in the same arm thereby leaving the other upper extremity free to aid in the changes in position. After a suitable rest period to permit return to the steady state, repeat measurements of the right and left heart pressures and cardiac output are performed at rest and exercise.

All pressure measurements are made on a six channel photographic recorder* employing Statham strain gauges P23AA, P23D and more recently P23G. Blood gas analysis is performed by standard techniques on a Van Slyke manometric apparatus. Expired gas analyses are carried out with a Scholander gas analyzer.

In the supine position the reference level for right heart pressures is 5 cm. dorsal to the angle of Lewis. In the prone position the reference level is also 5 cm. dorsal to this angle. A level 10 cm. dorsal to the angle of Lewis has been adopted as the zero level for left heart pressure in this study in both supine and prone positions.

Materials

Fifty-five simultaneous combined right and left heart catheterizations have been performed to date in 45 patients; mitral valve disease was present in 33 of these patients. Eleven combined and two right heart catheterizations in five patients have been selected to illustrate the afore-mentioned causes of pulmonary hypertension in patients with rheumatic heart disease. D.D., a 40 year old white man was investigated pre-operatively, and one month and 10 months post-operatively with right and left heart catheterization. S.B., a 41 year old colored woman was catheterized before surgery and one and 12 months post-surgery, with right and left heart catheterization. J.V., a 32 year old white woman was studied before surgery and 11 months after surgery with combined heart catheterization, in addition to right heart studies one and two months after commissurotomy. R.R., a 30 year old white woman was catheterized before surgery and one month after commissurotomy with combined heart catheterization. The diagnosis in these four subjects before surgery was pure mitral stenosis. The fifth patient, S.M., a 48 year old white man, had severe aortic stenosis with minimal aortic insufficiency; simultaneous right and left heart catheterization was performed during the evaluation work-up. He refused surgical intervention and died one month later.

*Electronics for Medicine, White Plains, N. Y.

Results

Pulmonary hypertension due predominately to mitral valve block is illustrated in Figures 1-5; these curves were obtained in R.R., a 30 year old white woman. Pulmonary hypertension is present at rest pre-operatively, with a further increase noted during exercise, (Fig. 1). Left heart catheterization revealed a large left atrial—left ventricular mean diastolic gradient, 16 mm. Hg at rest. On exercise the gradient rose to 24 mm. Hg. (Fig. 2). One month after surgery pulmonary artery pressure was

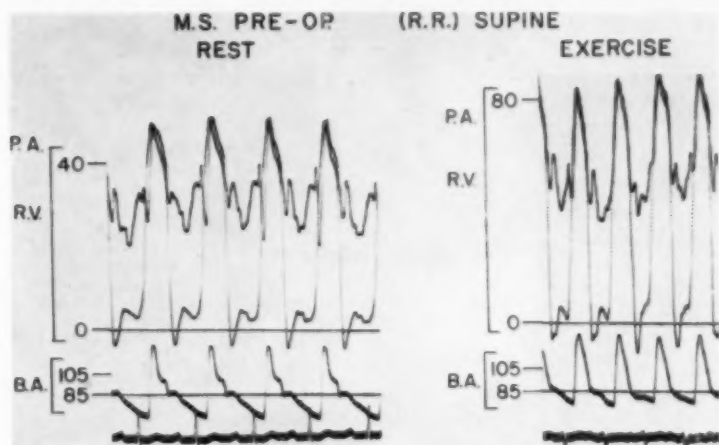


FIGURE 1: Pulmonary artery, right ventricle and brachial artery pressure curves in R.R. before surgery. The resting pulmonary hypertension is further increased during exercise. Paper speed 25 mm. per second.

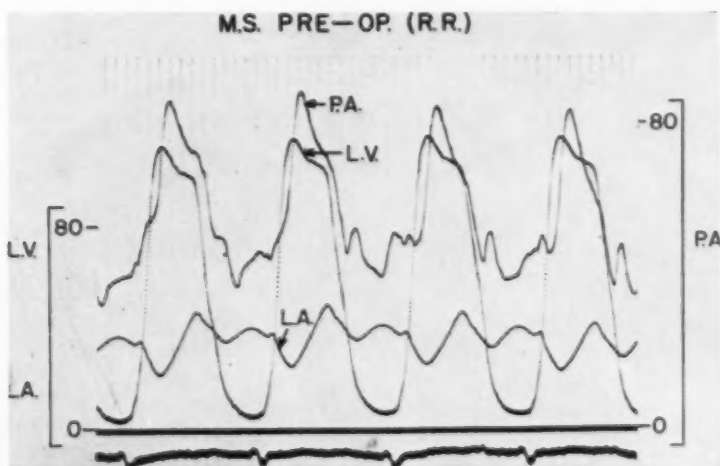


FIGURE 2: Left heart exercise curves in R.R. pre-operatively. The mean diastolic left atrial-left ventricular gradient is 24 mm. Hg. Paper speed is 75 mm. per second.

at the upper limit of normal at rest, Fig. 3. During exercise minimal residual pulmonary hypertension developed. Left heart catheterization at this time demonstrated a mean diastolic gradient of 3 mm. Hg., Fig. 4; on exercise the gradient increased to 6 mm. Hg., Fig. 5. The cardiac output data during the latter study are illustrated in Table I. The close

TABLE I
CARDIAC OUTPUT DATA
R.R. 10/24/56 B.S.A. 1.55

| Output Number | Cardiac Index (L./Min./M. ² B.S.A.) | Oxygen Consumption (ml./Min./M. ² B.S.A.) | A-V Difference (Vol. Per Cent) | R |
|---------------|---|---|-----------------------------------|-------------|
| 1. | 3.91 | 121 | 3.1 | .82 |
| 2. | 3.65 | 124 | 3.4 | .82 |
| 3. (3 Min.) | 4.77 | 257 | 5.4 | .85 (exer.) |
| 4. (7 Min.) | 4.95 | 272 | 5.5 | .97 (exer.) |
| 5. | 3.81 | 118 | 3.2 | .85 |
| 6. | 3.87 | 120 | 3.1 | .88 |
| 7. (11 Min.) | 4.47 | 259 | 5.8 | .96 (exer.) |

Table I: Cardiac output data in R.R. one month after surgery. Outputs 1 and 2 are the resting outputs during right heart catheterization; output 6 is the resting output during combined heart catheterization. The agreement in cardiac index, oxygen consumption, arteriovenous difference and respiratory quotient is excellent.

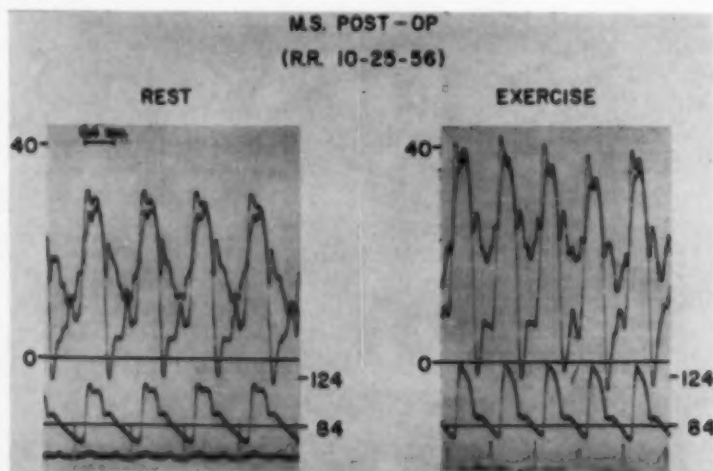


FIGURE 3: Post-operative right heart catheterization data in R.R. Mild pulmonary hypertension is present only during exercise. Study performed October 24, 1956.

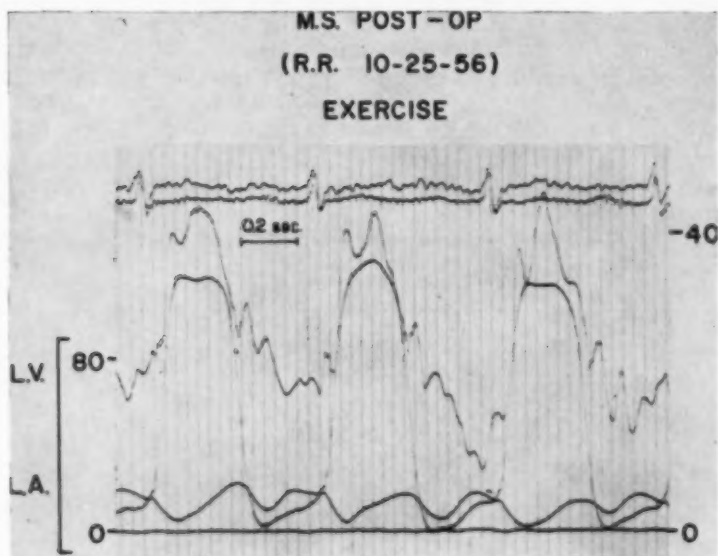


FIGURE 4: One month after surgery the resting mean diastolic left atrial—left ventricular gradient is 3 mm. Hg. at rest. (R. R.) Study performed October 24, 1956.

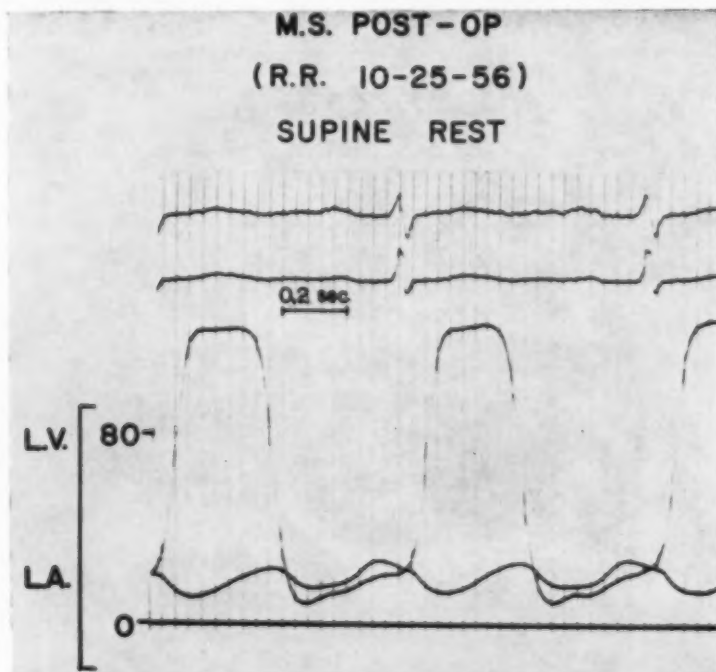


FIGURE 5: During exercise the gradient rises to 6 mm. Hg. Study performed October 24, 1956.

correlation between outputs 1, 2 and 5 during right heart catheterization and output 6 during combined right and left heart catheterization is readily noted. The pre- and post-operative catheterization findings are summarized in Tables II and III.

Pulmonary hypertension secondary to pulmonary vascular disease and to mitral valve block is demonstrated in Figures 6-14. The patient is D.D. Right heart catheterization before surgery shows marked pulmo-

TABLE II
CARDIAC OUTPUT DATA R. Ros. (Rest)

| Date | B.S.A. (M. ²) | | Cardiac Output (Total-/M. ²) | | S.V. (ml./beat) | O ₂ Consumption (Total-/M. ²) | | A-V (Vol. Per Cent) | R |
|----------|------------------------------|---|---|------|--------------------|---|-----|------------------------|-----|
| 7/ 5/56 | 1.63 | R | 5.43 | 3.33 | 57 | 201 | 123 | 3.7 | .82 |
| | | R | 4.90 | 3.01 | 57 | 191 | 117 | 3.9 | .84 |
| 10/24/56 | 1.55 | R | 6.06 | 3.91 | 76 | 188 | 121 | 3.1 | .82 |
| | | R | 5.65 | 3.65 | 72 | 192 | 124 | 3.4 | .82 |
| | | R | 5.90 | 3.81 | 70 | 183 | 116 | 3.2 | .85 |
| | | C | 6.00 | 3.87 | 66 | 186 | 120 | 3.1 | .88 |

Table II: Resting cardiac outputs in R.R. pre-operative, and one month after commissurotomy. "R" refers to right heart catheterization; "C" refers to combined heart catheterization. The output has risen after surgery.

TABLE III
HEMODYNAMIC DATA R. Ros.

| Date | | P.C. m | P.A. s/d,m | R.V. s/d | R.A. m | B.A. s/d,m | L.V. s/d | L.A. m | L.A.-L.V. Diast. Grad. |
|----------|------|-----------|---------------|-------------|-----------|---------------|-------------|-----------|---------------------------|
| 7/ 5/56 | R | 20 | 50/26,34 | 50/2 | 2 | 121/66,89 | | | |
| | Ex. | | 87/49,61 | 86/5 | | 135/73,93 | | | |
| | C.S. | | 44/27,32 | 45/2 | | | 100/8 | 23 | 16 |
| | Ex. | | 73/43,55 | | | | 112/9 | 38 | 24 |
| 10/24/56 | R | | 27/12,17 | 27/3 | 2 | 118/66,86 | | | |
| | Ex. | | 36/19,25 | 38/3 | | 130/70,95 | | | |
| | C.S. | | 31/13,21 | | | | 114/13 | 14 | 3 |
| | Ex. | | 38/20,26 | | | | 125/13 | 14 | 6 |

Table III: Hemodynamic pressure data in R.R. The marked fall in pulmonary artery pressure one month after surgery suggests that mitral block was the major factor causing pulmonary hypertension. The marked reduction in the atrio-ventricular gradient after surgery is noteworthy. "R" refers to right heart catheterization. "C.S." refers to combined heart catheterization, supine.

nary hypertension at rest, with a further rise during exercise, Fig. 6. The left atrial—left ventricular gradient at rest is 13 mm. Hg., Fig. 7. The operating room studies are pictured in Figs. 8 and 9. One month after surgery pulmonary hypertension persists at rest and during exercise, Fig. 10, despite almost complete abolition of the left atrial—left ventricular mean diastolic gradient both at rest and exercise, Fig. 11. A further fall in right heart pressures is noted 10 months after commis-

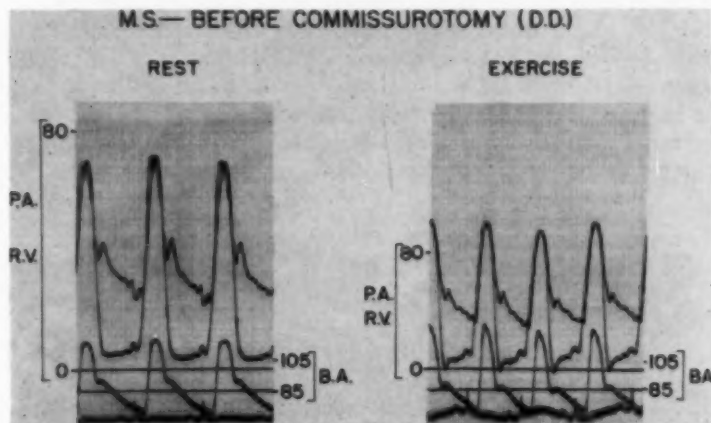


FIGURE 6: Right heart Catheterization data in D. D., pre-operatively. There is marked pulmonary hypertension at rest with a further increase during exercise.

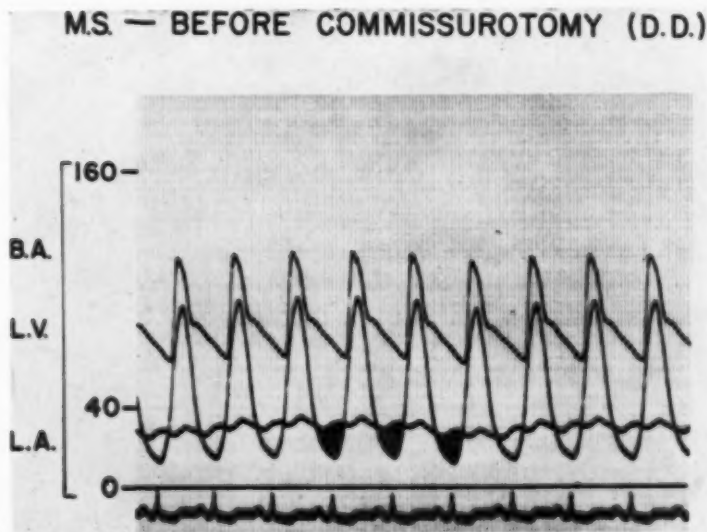


FIGURE 7: Pre-operative left heart catheterization data in the same patient. The left atrial hypertension and mean diastolic left atrial—left ventricular pressure gradient is readily noted.

surotomy, Fig. 12, at which time the mean diastolic mitral gradient is 1 and 3 mm. Hg. at rest and exercise respectively, Fig. 13 and 14. The overall catheterization data is shown in Tables IV and V.

More complete regression of pulmonary vascular disease is demonstrated by the data in Tables VI and VII in J. V.

The hemodynamic effects of pulmonary vascular disease and recurrent mitral stenosis are given in tables VIII and IX, and Figures 15-17 in S. B. Moderately severe mitral insufficiency was produced during commissurotomy. Despite marked reduction in the mean diastolic gradient and despite a normal left ventricular end-diastolic pressure (and therefore absence of left ventricular failure) marked pulmonary hypertension both at rest and exercise was noted one month after surgery. One year after surgery, the restenosis of the mitral valve was accompanied by slight elevation of the level of pulmonary hypertension again in the ab-

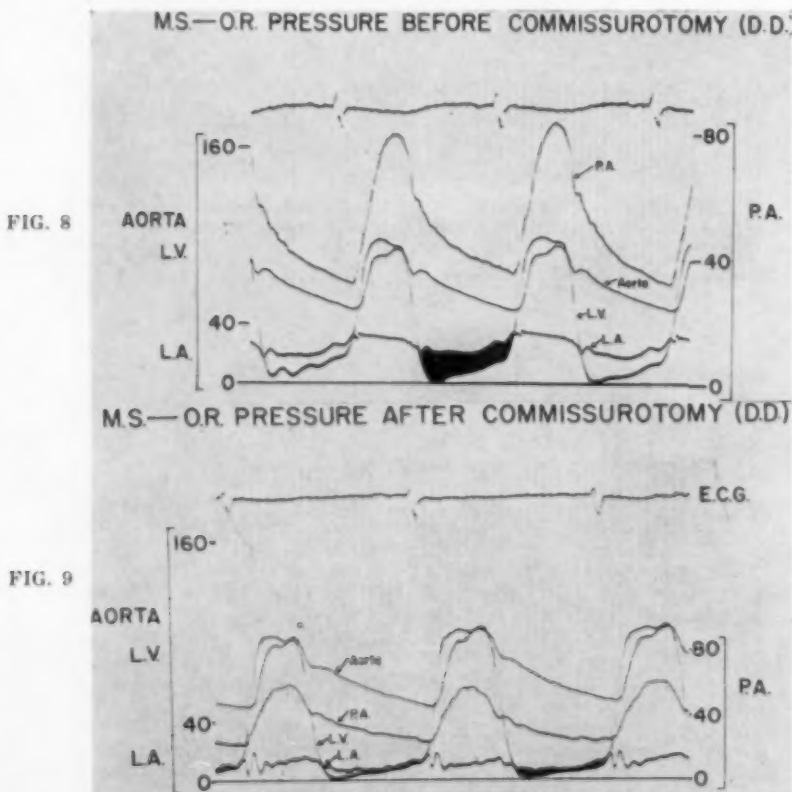


Figure 8: Operating room pre-commissurotomy pressures in D.D.—Figure 9: Operating room post-commissurotomy pressures in D.D. The marked decrease in the diastolic gradient is readily seen.

TABLE IV
CARDIAC OUTPUT DATA D. Dix (Res)

| Date | B.S.A. (M. ²) | | Cardiac Output (Total-/M. ²) | | S.V. ml./beat | O ₂ Consumption (Total-/M. ²) | | A-V (Vol. Per cent) | R |
|---------|------------------------------|---|---|------|------------------|---|-----|------------------------|-----|
| 4/26/56 | 1.67 | R | 3.10 | 1.86 | 52 | 208 | 125 | 6.7 | .93 |
| | | R | 3.30 | 1.98 | 50 | 214 | 128 | 6.5 | .73 |
| 6/28/56 | 1.61 | R | 4.02 | 2.49 | 61 | 201 | 125 | 5.0 | .77 |
| | | R | 3.71 | 2.31 | 56 | 204 | 127 | 5.5 | .77 |
| | | R | 4.09 | 2.54 | | 217 | 135 | 5.3 | .76 |
| 3/14/57 | 1.73 | R | 3.83 | 2.21 | 56 | 207 | 120 | 5.4 | .69 |
| | | C | 4.19 | 2.42 | 59 | 218 | 126 | 5.2 | .72 |
| | | C | 4.37 | 2.53 | 64 | 223 | 129 | 5.1 | .72 |

Table IV: Resting cardiac outputs in D.D., before surgery and one and ten months after commissurotomy. There is a clear rise in flow after surgery.

TABLE V
HEMODYNAMIC DATA D. Dix.

| Date | P.C. m | P.A. s/d,m | R.V. s/d | R.A. m | B.A. s/d,m | L.V. s/d | L.A. m | L.A.-L.V. Diast. Grad |
|---------|-----------|---------------|-------------|-----------|---------------|-------------|-----------|--------------------------|
| 4/26/56 | R 19 | 75/27,42 | 75/5 | 3 | 117/70,84 | | | |
| | Ex. | 103/36,57 | 102/11 | | 114/66,87 | | | |
| | C.S. | 98/34,55 | | | | 95/ 9 | 21 | 13 |
| 6/28/56 | R 8 | 52/18,30 | 54/5 | | 119/67,87 | | | |
| | Ex. | 71/26,42 | 72/5 | | 131/63,89 | | | |
| | C.S. | 68/22,36 | | | | 114/11 | 10 | 1 |
| | Ex. | 91/37,55 | | | | 127/13 | 14 | 4 |
| 3/14/57 | R 15 | 33/10,19 | 33/4 | | 125/64,90 | | | |
| | Ex. | 52/19,30 | 52/3 | | 142/70,97 | | | |
| | C.S. | 45/13,24 | 45/4 | | | 127/10 | 11 | 1 |
| | Ex. | 62/21,36 | 62/5 | | | 132/ 9 | 9 | 3 |

Table V: Pressure data in D.D. before and after surgery.

sence of an elevation in the left ventricular end diastolic pressure. The post-operative mitral insufficiency is noted in Figs. 16 and 17.

Pulmonary hypertension secondary to left ventricular failure with an elevation of the left ventricular end-diastolic pressure is demonstrated in Fig. 18 and Tables X and XI. Mitral stenosis was not found during the combined heart catheterization or during the post-mortem examination one month later. The elevation in left ventricular end-diastolic, left atrial mean and mean pulmonary artery wedge pressure all are most compatible with pulmonary hypertension secondary to left ventricular failure.

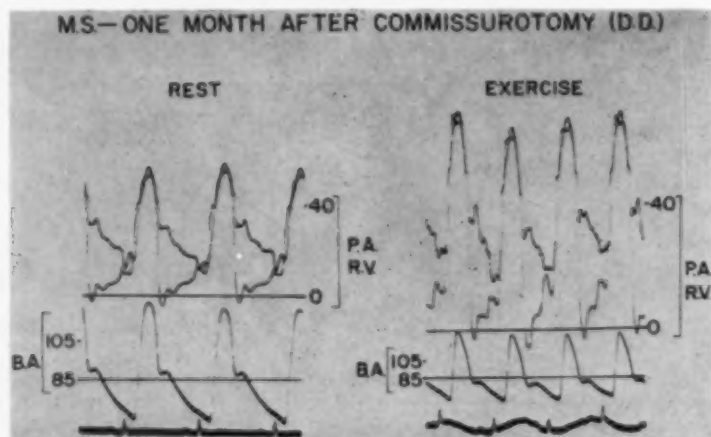


FIGURE 10: Right heart curves in D.D. one month after surgery. There has been a decrease in the level of pulmonary artery pressure at rest and exercise, but marked pulmonary hypertension persists.

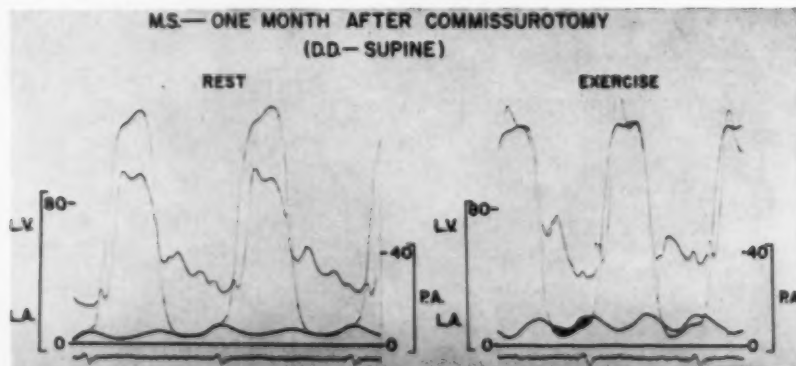


FIGURE 11: Left heart catheterization data in D.D. one month after commissurotomy. The diastolic gradient is 1 mm. Hg. at rest and 4 mm. Hg. during exercise. The left ventricular end-diastolic pressure is normal throughout.

FIG. 12

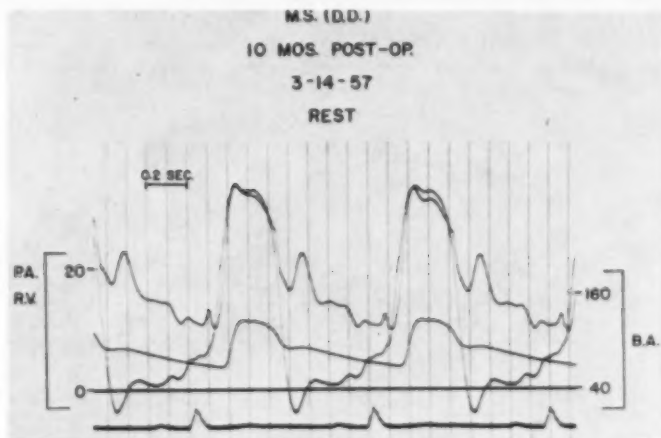


FIG. 13

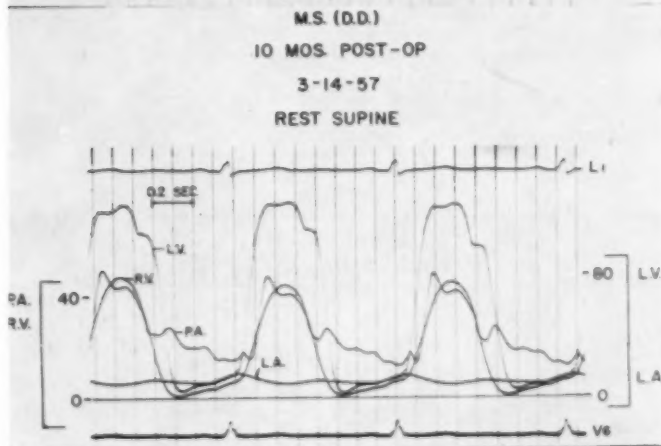


FIG. 14

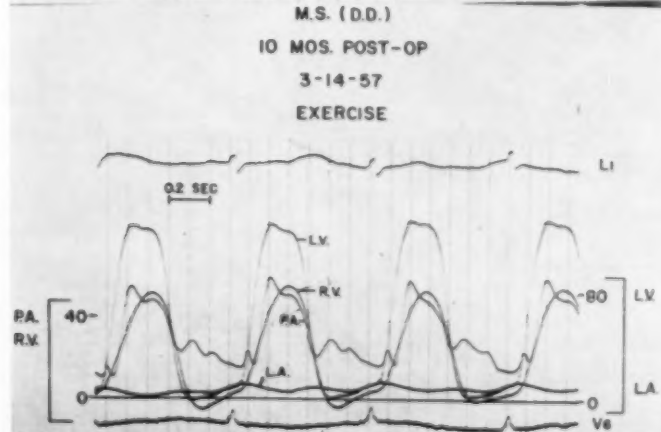


Figure 12: Ten months after surgery a further fall in pulmonary artery pressure is noted in D.D.—Figure 13: Right and left heart curves in D.D., at rest supine ten months after commissurotomy. The resting gradient is 1 mm. Hg.—Figure 14: The exercise gradient is 3 mm. Hg., D.D.

TABLE VI
CARDIAC OUTPUT DATA J. Van. (Rest)

| Date | B.S.A. (M. ²) | | Cardiac Output (Total-/M. ²) | | S.V. (ml./beat) | O ₂ Consumption (Total-/M. ²) | | A-V (Vol. Per Cent) | R |
|---------|------------------------------|---|---|------|--------------------|---|-----|------------------------|-----|
| 4/12/56 | 1.56 | R | 3.82 | 2.45 | 58 | 193 | 124 | 5.1 | .86 |
| | | R | 4.00 | 2.56 | 59 | 196 | 126 | 4.9 | .87 |
| 6/ 2/56 | 1.49 | R | 3.64 | 2.44 | 49 | 200 | 134 | 5.5 | .80 |
| | | R | 3.70 | 2.49 | 47 | 200 | 134 | 5.4 | .89 |
| 7/12/56 | 1.52 | R | 4.30 | 2.83 | 48 | 228 | 150 | 5.3 | .87 |
| | | R | 4.07 | 2.68 | 51 | 203 | 134 | 5.0 | .88 |
| 4/23/57 | 1.55 | R | 4.30 | 2.77 | 52 | 202 | 130 | 4.7 | .78 |
| | | R | 4.60 | 2.97 | 57 | 230 | 148 | 5.0 | .78 |

Table VI: Resting cardiac outputs in J.V. before commissurotomy and one, two and twelve months after surgery. The postoperative rise in output is again to be noted.

TABLE VII
HEMODYNAMIC DATA J. Van.

| Date | P.C. m | P.A. s/d,m | R.V. s/d | R.A. m | B.A. s/d,m | L.V. s/d | L.A. m | L.A.-L.V. Diast. Grad. |
|---------|-----------|---------------|-------------|-----------|---------------|-------------|-----------|---------------------------|
| 4/12/56 | R 19 | 38/18,26 | 38/4 | 3 | 116/70,85 | | | |
| | Ex. | 87/43,60 | 87/5 | | 159/90,115 | | | |
| | C.S. | 40/17,26 | 42/4 | | | 92/11 | 19 | 8 |
| | Ex. | 87/37,54 | | | | 108/13 | 29 | 13 |
| 6/ 2/56 | R 7 | 26/10,17 | 27/2 | | 120/74,97 | | | |
| | Ex. | 37/18,24 | 39/2 | | 155/85,112 | | | |
| 7/12/56 | R 4 | 25/11,14 | 25/1 | | 121/75,92 | | | |
| | Ex. | 32/15,18 | 34/2 | | 140/80,100 | | | |
| 4/23/57 | R 3 | 16/ 6,10 | | | 124/69,89 | | | |
| | Ex. | 27/10,16 | | | 155/75,104 | | | |
| | C.S. | 16/ 6, 9 | | | | 105/ 7 | 7 | 1 |
| | Ex. | 25/ 9,13 | | | | 125/ 7 | 7 | 2 |

Table VII: Right and left heart hemodynamic data in J.V. before and after surgery.

TABLE VIII
CARDIAC OUTPUT DATA S. Bri. (Rest)

| Date | B.S.A. (M. ²) | | Cardiac Output (Total-/M. ²) | | S.V. (ml./beat) | O ₂ Consumption (Total-/M. ²) | | A-V (Vol. Per Cent) | R |
|---------|------------------------------|---|---|------|--------------------|---|-----|------------------------|-----|
| 2/ 9/56 | 1.65 | R | 4.13 | 2.51 | 48 | 186 | 112 | 4.5 | .87 |
| | | R | 4.09 | 2.48 | 47 | 180 | 109 | 4.4 | .90 |
| 3/31/56 | 1.61 | R | 3.74 | 2.32 | 43 | 179 | 111 | 4.8 | .84 |
| | | R | 3.40 | 2.11 | 51 | 170 | 106 | 5.0 | .85 |
| 2/21/57 | 1.66 | R | 3.20 | 1.93 | 46 | 176 | 106 | 5.5 | .75 |
| | | R | 2.93 | 1.77 | 41 | 170 | 102 | 5.8 | .78 |

Table VIII: Resting outputs in S.B. The outputs have fallen sharply subsequent to the inadvertent production of mitral insufficiency at surgery.

TABLE IX
HEMODYNAMIC DATA S. Bri.

| Date | P.C. m | P.A. s/d,m | R.V. s/d | R.A. m | B.A. s/d,m | L.V. s/d | L.A. m | L.A.-L.V. Diast. Grad. |
|---------|-----------|---------------|-------------|----------------|---------------|-------------|-----------|---------------------------|
| 2/ 9/56 | R 24 | 63/28,41 | 61/2 | | 110/64,85 | | | |
| | Ex. | 127/55,77 | | | 133/71,94 | | | |
| | C.P. | | | | 116/69,89 | 98/ 4 | 20 | 12 |
| 3/31/56 | R | 51/28,37 | | 2 | 114/63,79 | | | |
| | Ex. | 87/40,60 | | | 108/64,84 | | | |
| | C.P. | | | | 113/68,89 | 106/10 | 14 | 3 |
| 2/21/57 | R | 65/25,40 | 65/3 | 0 | 109/66,85 | | | |
| | Ex. | 134/54,84 | 134/17 | 9 ^a | 146/84,117 | | | |
| | C.P. | | | | | 112/11 | 16 | 9 |

a. Z point = 14 mm. Hg.

Table IX: Right and left heart pressure levels in S.B. "C.P." refers to combined heart catheterization, prone.

Discussion

Right heart catheterization cannot be relied upon to readily separate pulmonary vascular disease, mitral valve block, and left heart failure as etiological factors in the production of pulmonary hypertension. Pulmonary vascular disease can theoretically be separated from the other mechanisms via the pulmonary artery wedge pressure.⁵ However normal pulmonary artery wedge pressure has been recorded in subjects with physiologically and surgically proven mitral stenosis in our laboratory. The pulmonary artery wedge pressure in Fig. 19 is 12 mm. Hg., a level within normal limits. Figure 20 illustrates the left heart catheterization curves.

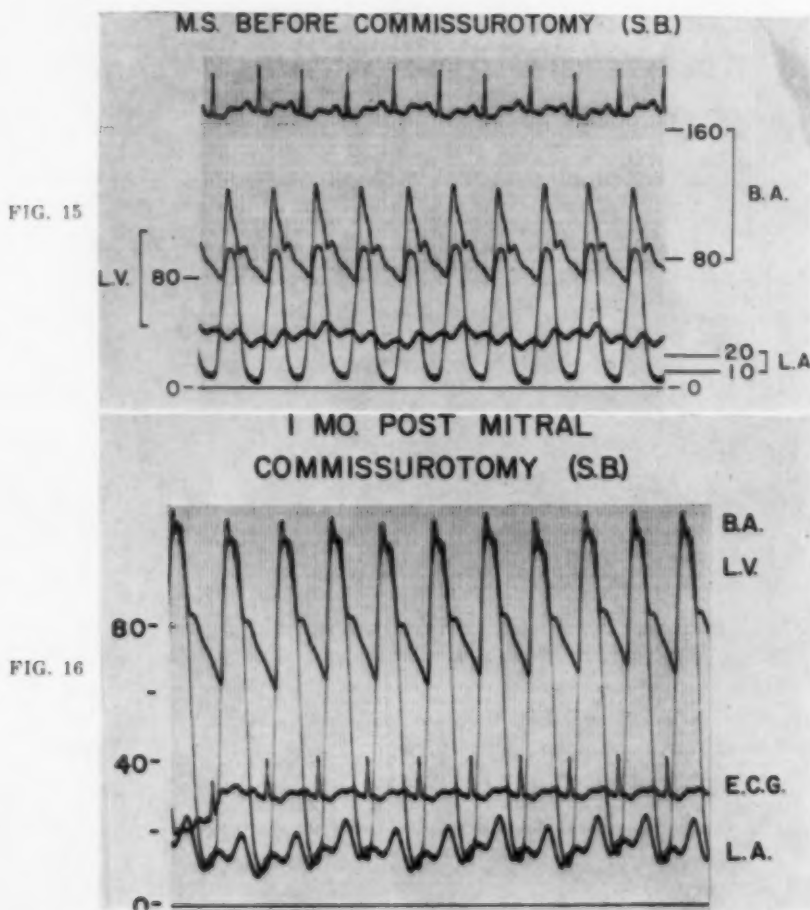


Figure 15: Left heart catheterization curves (prone) in S.B., pre-operatively. There is no evidence of mitral insufficiency.—Figure 16: One month after commissurotomy. The diastolic gradient has been reduced to 3 mm. Hg., prone position. The left atrial curve is suggestive of mitral insufficiency.

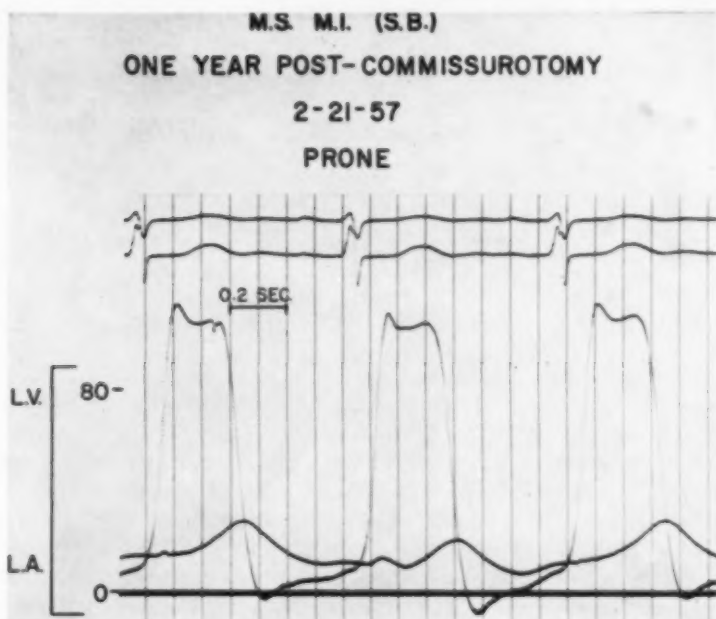


FIGURE 17: Left heart curves one year after surgery in S. B. A mean diastolic atrio-ventricular gradient has reappeared.

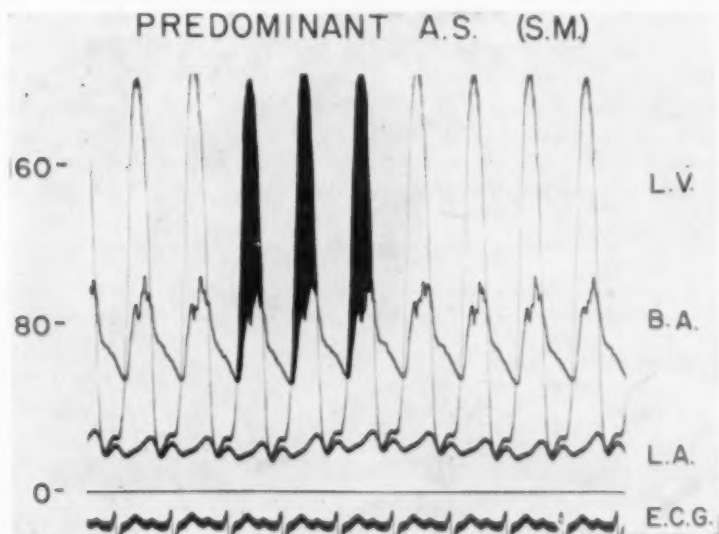


FIGURE 18: Severe aortic stenosis in S. M. The left atrial mean and left ventricular end-diastolic pressures are markedly elevated.

TABLE X
CARDIAC OUTPUT DATA S. Mar.

| Date | B.S.A. (M. ²) | | Cardiac Output (Total-/M. ²) | | S.V. (ml./beat) | O ₂ Consumption (Total-/M. ²) | | A-V (Vol. Per Cent) | R |
|---------|------------------------------|-----|---|------|--------------------|---|-----|------------------------|------|
| 3/17/56 | 1.47 | R | 3.60 | 2.45 | 39 | 263 | 179 | 7.3 | .84 |
| | | R | 3.40 | 2.31 | 36 | 256 | 174 | 7.5 | .79 |
| | | Ex. | 4.03 | 2.74 | 32 | 512 | 348 | 12.7 | .93 |
| | | Ex | 3.59 | 2.44 | 28 | 481 | 327 | 13.4 | 1.00 |

Table X: Rest and exercise outputs in S.M., a patient with severe aortic stenosis.

There is a significant mean diastolic left atrial—left ventricular gradient; at surgery the mitral valve was found to be markedly stenotic. The presence of normal pulmonary artery wedge pressure does not signify the absence of mitral valve block.

On the other hand, combined right and left heart catheterization permits direct demonstration of the presence or absence of mitral valve block and left ventricular failure by determination of the atrio-ventricular diastolic gradient and the left ventricular end-diastolic pressure. Concomitant determination of pulmonary artery pressure and cardiac output permits an approximate evaluation of pulmonary arteriolar resistance. Elevated pulmonary resistance levels are suggestive in turn of pulmonary vascular disease. It is thus possible to adduce evidence for any or all of the three projected mechanisms for the production of pulmonary hypertension by means of right and left heart catheterization. In any one patient however the quantitative contribution of these abnormalities to the degree of pulmonary hypertension may be difficult to evaluate.

The catheterization data in D. D. are of considerable interest. There is a large left atrial—left ventricular gradient at rest, 13 mm. Hg. De-

TABLE XI
HEMODYNAMIC DATA S. Mar.

| Date | | P.C. m | P.A. s/d,m | R.V. s/d | R.A. m | B.A. s/d,m | L.V. s/d | L.A. m | L.V.-B.A. Syst. Grad. |
|---------|------|-----------|---------------|-------------|-----------|---------------|-------------|-----------|--------------------------|
| 3/17/56 | R | 20 | 44/25,31 | | 1 | 98/62,78 | | | |
| | Ex. | | 88/46,59 | | | 111/60,78 | 207/26 | 23 | 68 |
| | C.P. | | | | | | | | |

Table XI: Pressure studies demonstrate marked elevation of left atrial mean pressure and of the left ventricular end-diastolic pressure.

spite almost complete abolition of the gradient, pulmonary hypertension persisted one month after surgery. In the presence of a normal left ventricular end-diastolic pressure, residual pulmonary vascular disease emerges as the most likely explanation of the post-operative hypertension in the lesser circuit. The cardiac output data at rest (Table II)

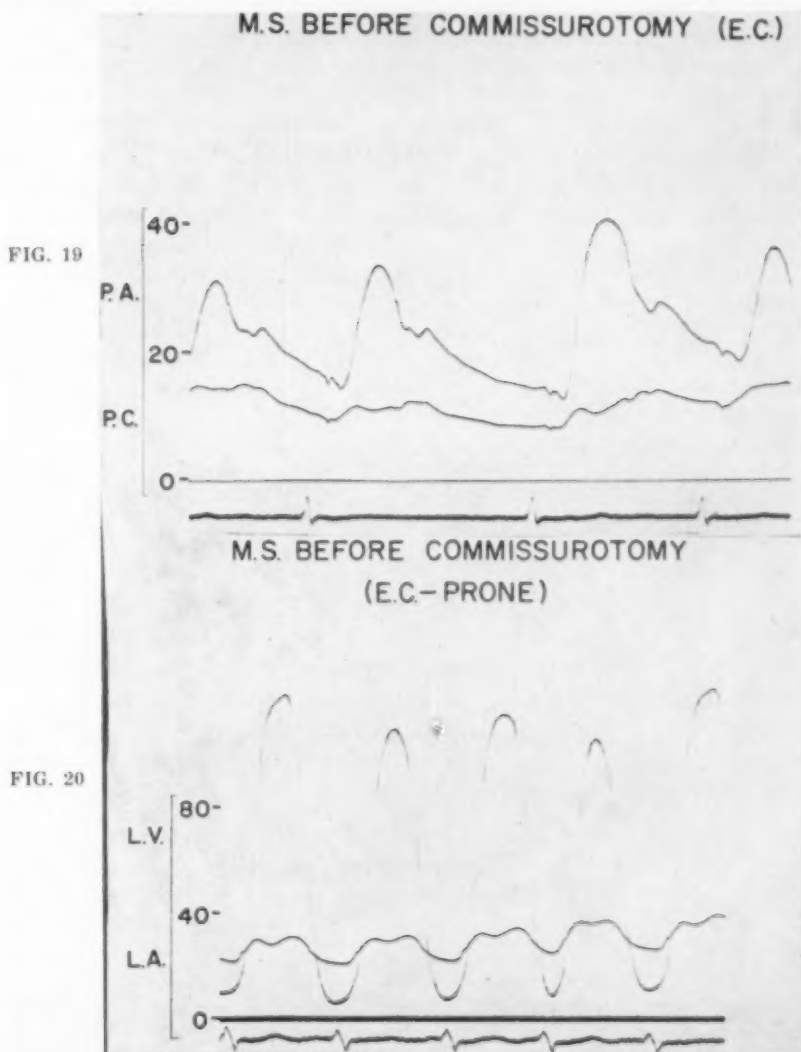


Figure 19: Pulmonary "capillary" pressure in E.C. The mean pressure is 12 mm. Hg., at the upper limit of normal.—Figure 20: There is an obvious significant mean diastolic left atrial—left ventricular gradient. Tight mitral stenosis was found at surgery.

demonstrate the rise in flow after commissurotomy. No recurrence of mitral stenosis was noted ten months after surgery.

Complete restoration of pulmonary artery pressure to normal levels over the course of one year after surgery is demonstrated in Table VII. The most marked fall in pulmonary artery pressure occurred in the immediate post-operative period suggesting that mitral block was the major cause of pulmonary artery pressure elevation. The continued fall over the course of one year illustrates the effect of resolution of pulmonary vascular disease. A gradual, but slight rise in cardiac output was noted over this period.

Multiple catheterization studies in S.B. demonstrate the hemodynamic effects of the surgical production of mitral insufficiency. A progressive fall in cardiac index developed after surgery. The pre-operative gradient (12 mm. Hg) fell to 3 mm. Hg. The persistent pulmonary hypertension at this time may at first glance be ascribed to pulmonary vascular disease. It is possible that severe mitral insufficiency may also contribute to pulmonary hypertension because of elevation of mean left atrial pressure secondary to the mitral insufficiency. The 9 mm. Hg gradient one year after surgery suggests restenosis of the mitral valve. In the presence of mitral insufficiency, the flow across the valve in diastole is increased. The diastolic gradient is thus larger (for a given sized mitral valve) than it

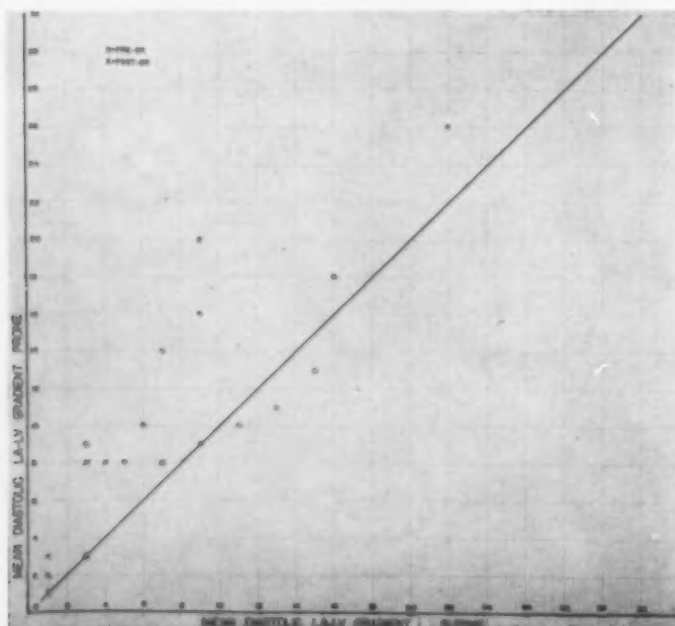


FIGURE 21: The mean diastolic atrio-ventricular gradient supine is plotted on the abscissa; the prone gradient is on the ordinate. The deviation from the 45° line of identity is to be noted.

would be in the absence of insufficiency; the gradient magnitude must therefore be interpreted carefully when significant insufficiency is present.

The data in S.M. illustrate the production of pulmonary hypertension by left heart failure.

One further point deserves emphasis. The mean diastolic left atrial - left ventricular gradient varies in the prone and supine positions. This is illustrated in Fig. 21. The prone gradient is plotted on the ordinate and the gradient supine is plotted on the abscissa. The continuous line has been drawn at a 45 degree angle. If the gradients were identical in the two positions, the points would fall along the theoretical straight line. The wide divergence from this line is readily seen. Since various laboratories perform left heart catheterization in different positions^{6,8} (prone or supine) difficulties in gradient interpretation can readily arise.

SUMMARY

Pulmonary vascular disease, mitral valve block, left heart failure, or any combination of these factors may cause pulmonary hypertension. Right heart catheterization alone, in rheumatic heart disease, cannot differentiate among these possibilities. Right and left heart catheterization is of great aid, however, in resolution of the problem. Five cases are discussed to illustrate the value of combined heart catheterization.

Drs. Robert S. Litwak, Francis Cooke, DeWitt Daughtry and Myron Segal performed mitral commissurotomy as indicated in these patients.

RESUMEN

La enfermedad pulmonar vascular, el bloqueo de la válvula mitral, el desfallecimiento cardíaco izquierdo o cualquiera de las combinaciones de estos factores, puede causar la hipertensión pulmonar.

El cateterismo del lado derecho del corazón solo, en la enfermedad cardíaca reumática no puede diferenciar estas posibilidades.

La cateterización derecha e izquierda es de gran ayuda, sin embargo, para resolver el problema. Se discuten cinco casos para ilustrar el valor de la cateterización combinada del corazón.

RESUME

L'atteinte de l'artère pulmonaire, l'obstruction de la valvule mitrale, l'arrêt du coeur gauche, ou toute combinaison de ces trois facteurs peut être à l'origine d'hypertension pulmonaire. Dans le rhumatisme cardiaque, le cathétérisme du coeur droit seul ne peut pas distinguer ces diverses éventualités. Le cathétérisme des cavités droites et gauches est cependant d'un grand secours à ce point de vue. Les auteurs mettent en discussion cinq observations qui illustrent la valeur du cathétérisme cardiaque combiné.

ZUSAMMENFASSUNG

Pulmonale Gefässerkrankung, Mitralklappenblock, Versagen des linken Herzens oder irgendeine Kombination dieser Faktoren kann die Ursache

für einen pulmonalen Hochdruck sein. Eine Katheterisierung des rechten Herzens allein kann bei rheumatischer Herzerkrankung nicht zwischen diesen Möglichkeiten unterscheiden. Eine Katheterisierung des rechten und linken Herzens ist jedoch von grosser Hilfe für die Lösung des Problems. 5 Fälle werden besprochen, um den Wert der kombinierten Herz-Katheterisierung zu veranschaulichen.

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Myocardial Revascularization by Means of Cardiopneumopexy and Ivalon Graft

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Cardiopneumopexy will aid and augment natural processes in revascularizing the ischemic myocardium. By cardiopneumopexy we mean grafting the left lung to the heart after removal of the twin barriers of pericardium and epicardium. Lezius, the German investigator, whose death from coronary occlusion occurred all too early in life, initiated this concept in 1937. We worked in our laboratory unaware of Lezius' work until well into our explorations. Then, upon becoming acquainted with his ideas, integrated his thoughts into our program and investigated the whole concept in detail over the past five years.

Our current concept of the technique of cardiopneumopexy is wide incision of the pericardium from apex to the base of the heart, phenol epicardiolysis, asbestos poudrage and suturing of the lung to the myocardium over as broad an area as possible. Usually the lingula is used. In some instances the lung is sutured to the inner surface of the pericardium when sutures through a scarred infarct of the heart might result in a tear into the chamber of the ventricle, as we experienced once clinically.

Coronary heart disease being the leading single cause of death in the United States, killing annually as many people as all forms of cancer, one-quarter of a million individuals, myocardial revascularization is an appealing target for surgical research. Since one out of four patients dies at the time of his first attack and of the survivors 10 per cent die each succeeding year, giving such a patient a life expectancy of only four and one half years if he survives the initial attack, more must be offered to these patients than the current traditional medical treatment.

Our surgical goal is to relieve angina, to lengthen life and to return the patient to productive labor and a satisfactory position in society.

Approximately 187 dogs have been utilized in all phases of this investigation. Nineteen patients have undergone cardiopneumopexy in the past three years with two hospital deaths and two deaths occurred subsequently, one at three months and one at six months.

The two deaths, from ventricular fibrillation, that occurred post-operatively in the hospital were due to the problem of selection of cases, a question that experience now has corrected. The patient who died three months postoperatively had coronary artery disease that had advanced to the stage where revascularization was of little value; this degree of coronary disease we now feel cannot always be predicted by medical means before surgery. The man who died six months postoperatively had a lone predominate coronary artery which was 95 per cent occluded at

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This work was carried out under a grant of the Washington State Heart Association in the Research Laboratory of Seattle Veterans Administration Hospital.

the time of surgery; this anatomic variation sealed his fate in the face of atherosclerosis. The others generally are doing well and we are encouraged, although at least another ten years are needed to fully evaluate this procedure. Angina has been substantially helped in all but one. In this one individual there is a considerable amount of fibrous and emphysematous lung disease which may be a factor in his myocardial anoxia.

All of the patients have had extensive medical profiles by internists and the majority have been seen by the same psychiatrist* to evaluate carefully the psychological and psychiatric aspects. The psychiatrist feels that he can frequently predict which patients will eventually develop coronary heart disease. He has been of great aid in separating psychic from somatic heart pain and in evaluating what part of the postoperative relief of angina is due to suggestion and what due to the surgery. His opinion has augmented information given us by devices like the treadmill.

We have not chosen to operate on patients over the arbitrary tissue age of 60 years, patients who have had concomitant serious vascular disease such as cerebrovascular accidents, intermittent claudication or aneurysms, patients who must be maintained on digitalis because of inadequate cardiac musculature or patients who have had a myocardial infarct more recently than six months.

Since virtually all coronary occlusions occur within the two main arteries or their primary branches, endarterectomy to remove the obstructing atherosclerotic material is an intriguing approach. Unfortunately, currently it is not technically feasible. So, we have postulated that to bridge the defect would be next best direct attack on the problem. We felt that an Ivalon graft could serve as a bridge over the occlusion. As a first step in that direction, we have sutured a tapered Ivalon graft to the subclavian artery and inserted the other end into a major coronary artery. Dogs have survived acute coronary occlusion after this procedure but the grafts do not continue to transmit blood. Apparently the peripheral myocardial field becomes obstructed. This work will be concluded in 1958 and then reported. Cardiopneumopexy currently is still the superior surgical technique for coronary insufficiency.

There is available a technique of radiographic visualization of the coronary arteries in vivo that brings to the horizon the possibility of delineating the area of obstruction in the coronary artery as neatly as we can in bronchiectasis by the use of iodized oil. This would accurately direct surgical attack on an offending vessel, when and if such a method becomes surgically feasible for patients.

SUMMARY

Coronary heart disease is the leading single cause of death. Current methods of medical therapy are not adequate. Ancillary surgical aids may be of help in treatment of this disease. Cardiopneumopexy has been demonstrated in the laboratory and clinically to be an encouraging method of

*Doctor Dugan's untimely death May 19, 1957, in his early thirties was a loss to the profession of a brilliant psychiatrist who had a solid basis in clinical medicine.

stimulating extracoronary and intracoronary collateral circulation. Ivalon grafts to by-pass the obstructed area in the coronary artery offer intriguing possibilities for the future. These surgical methods are no panacea; they are offered as actual and potential adjuncts to existing medical programs.

RESUMEN

La causa de muerte que va a la cabeza, es la enfermedad cardiaca coronaria. Los métodos actuales de tratamiento médicos no son adecuados. Los procedimientos quirúrgicos auxiliares pueden ser de utilidad en el tratamiento de esta enfermedad. La cardioneumopexia ha demostrado en el laboratorio y clínicamente también ser un método alentador para estimular la circulación colateral extra e intracoronaria. Los injertos de Ivalón para sortear el área obstruida en la arteria coronaria, ofrecen posibilidades atrayentes para el futuro. Estos métodos quirúrgicos no son una panacea; son ofrecidos como agregados reales y potenciales a los métodos que ya existen.

RESUME

L'atteinte des artères coronaires est la cause principale de la mortalité. Les méthodes courantes de traitement médical ne sont pas suffisantes. L'aide chirurgicale peut être d'un grand secours dans le traitement de cette affection. La cardio-pneumopexie s'est montrée être, au laboratoire et cliniquement, une méthode encourageante pour stimuler la circulation extra-coronarienne et intra-coronarienne collatérale. Les greffes d'"Ivalon" pour pallier à l'obstruction d'un segment de l'artère coronaire offrent des possibilités intéressantes pour l'avenir. Ces procédés chirurgicaux ne sont pas des panacées; ils sont des compléments actifs et efficaces aux possibilités médicales déjà existantes.

ZUSAMMENFASSUNG

Herzkranzgefäßerkrankung ist die führende alleinstehende Todesursache. Die gegenwärtige Methode der interen Behandlung ist nicht adäquat. Zustzliche chirurgische Hilfen können von Wert sein bei der Behandlung dieser Krankheit. Cardiopneumopexie hat sich im Laboratorium und Klinik als ein ermutigendes Verfahren erwiesen zur Reizung der extracoronaren und intracoronaren Kollateral-Zirkulation. Ivalon-Transplantate für einen Kollateralkreislauf des verschlossenen Abschnittes der Coronar-Arterien bieten interessante Möglichkeiten für die Zukunft. Diese chirurgischen Methoden sind kein Allheilmittel; sie bieten sich an als aktuelle und potentielle Zugabe für bestehende interne Behandlungspläne.

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CURRENT THERAPY

The Editorial Board invites your comment

The Management of the Hypertensive Patient

Considerable advances both in the diagnosis and treatment of hypertension have tended to confuse the management of the hypertensive patient. This discussion will in brief attempt to elucidate the problem.

Diagnosis

The term arterial hypertension implies elevation of both systolic and diastolic levels of pressure; the upper limit of normality being 150/90 mm of mercury. The finding of a persistently elevated diastolic pressure of over 90 mm of mercury is diagnostic of arterial hypertension. In the presence of emotional instability and obesity of the biceps area, increased pressures can be found, but under these circumstances, the elevation in diastolic pressure may not be significant. Recently Masters¹ has demonstrated that the levels of blood pressure tend to increase with age and the normal standard of 150/90 mm of mercury may have to be revised for the elder age groups.

Elevation of the diastolic pressure is primarily a result of increased peripheral arteriolar resistance due to generalized vasoconstriction or arteriolar narrowing. Elevation of the systolic pressure only may occur clinically and differs hemodynamically from arterial hypertension in that it is caused primarily by decreased distensibility of the aorta due to arteriosclerosis. This condition does not result in increased cardiac work and in general is benign requiring no treatment. Occasional cases of elevated systolic pressures are caused by an increase in cardiac output. (See Table 1)

When the presence of arterial hypertension is established, it is important that attempts to determine its etiology be made. It should be pointed out that while approximately 80 per cent of all cases of hypertension have no known etiology and are thus called "Essential," the remainder may have either a renal, neurogenic, hormonal or vascular etiology. Some of these cases are amenable to treatment and occasionally a dramatic cure of arterial hypertension may occur as a result of thoroughness in tracking down the possible causes of a patient's hypertension. Table 1 classifies the etiological causes of hypertension. As a result of compiling a careful history, doing a thorough physical examination and ordering appropriate laboratory examinations, it is possible to diagnose the etiological cause of hypertension and estimate the severity of the disease. Since the patient's management is determined by these two factors, the importance of this is obvious.

Table 2 summarizes the routine and specialized laboratory tests avail-

able as aids in determining the origin of arterial hypertension. The astuteness of the physician in the elaboration of the history and in the performance of the physical examination determines the extensiveness of the laboratory tests required. Obviously not all cases need be subjected to the entire battery of tests enumerated in Table 2.

Clinical descriptions of the various hypertensive syndromes have not been described because it is beyond the scope of this presentation; however, certain precepts concerning some of the syndromes and tests will be presented for the sake of emphasis.

Renal hypertension is commonly preceded by a history of renal disease or a history of an abnormal urinalysis unassociated with hypertension. Recently, the importance of unilateral renal disease as a cause for hypertension has been demonstrated by Howard² who has reported impairment in the excretion of sodium and water in an ischemic kidney. Removal of this kidney has resulted in a return to normal blood pressure. Several cases with normal excretory pyelograms have also shown this unilateral impairment of sodium and water excretion and following unilateral nephrectomy normal blood pressures were obtained.

Utilizing radioactive diodrast, Winter³ has been able to measure unilateral renal function without recourse to instrumentation. This technique may eventually have considerable importance as a screening test.

Chemical determination of catechol amines⁴ in the urine offers the most direct way to diagnosing the presence of a pheochromocytoma. The latter may be suspected in a young hypertensive who shows a significant drop in blood pressure when standing, or who has an elevated fasting blood sugar, elevated basal metabolic rate and gives a history of excessive perspiration. It should also be emphasized that false positive Regitine tests do occur and if possible should be confirmed with either a Benzodioxane or a urine catechol amine determination. Previous administration of antihypertensive drugs interfere with Regitine tests.

The rare case of primary aldosteronism⁵ can be suspected when serum potassium is low, serum sodium high or normal, serum chloride low, associated with a high carbon dioxide combining power and persistently alkaline urine.

Once the etiological basis of the hypertension has been determined, an evaluation of its severity has to be made. Frant's⁶ studies indicate that the higher the diastolic level of pressure, the worse is the prognosis but severity cannot be based merely on blood pressure levels since in any hypertensive patient, regardless of blood pressure level coronary thrombosis, cerebral vascular accidents, and acute left ventricular failure can occur without warning. At times, the first inkling that hypertension is present is the development of a cardiac or cerebral complication. There also are hypertensive patients who remain asymptomatic for many years despite markedly elevated blood pressures.⁷⁻⁸ Clinical symptoms mainly are determined by the presence and location of the arteriosclerotic process. The etiology of the latter is still speculative but probably is accelerated by the associated hypertension. It has been traditional to determine the

severity of arteriolar disease by ophthalmoscopic examination of the fundus. At times, a lack of correlation in the retinal arteriolar findings with the important clinical findings does occur which tends to confuse the clinician. However, fundusoscopic findings as described in the classification by Wagener and Keith⁹ serves as a useful indicator of the severity of the arteriolar sclerosis throughout the body. Thus evaluation cannot be reduced to simple terms, but must include a consideration of the level of diastolic pressure, evidences of vascular damage in the eye, heart, kidneys and brain and progressiveness of clinical symptoms.

TABLE I
CLASSIFICATION OF HYPERTENSION*

-
- I. ARTERIAL HYPERTENSION (Blood pressure 150/90 or greater)
- A. ESSENTIAL HYPERTENSION
- B. RENAL
- (1) Nephritides
 - (a) glomerulonephritis
 - (b) pyelonephritis
 - (c) gouty
 - (d) toxic, due to lead intoxication
 - (e) radiation nephritis
 - (f) diabetic glomerulosclerosis
 - (2) Diffuse Collagen Disease
 - (a) Disseminated lupus erythematosus
 - (b) Periarteritis nodosa
 - (c) Scleroderma
 - (3) Congenital Polycystic Kidney Disease
 - (4) Nephrocalcinosis
 - (5) Amyloid Disease
 - (6) Obstructive Uropathy
 - (7) Unilateral Kidney Disease
 - (a) Inflammatory, embolic, or atherosclerotic obstruction of renal artery
 - (b) Pyelonephritis
 - (c) Tumor
 - (d) Obstructive Uropathy
 - (e) Perinephritis
 - (8) Hypertension Due Toxemias of Pregnancy (May not be renal in origin)
- C. HORMONAL
- (1) Pheochromocytoma
 - (2) Primary aldosteronism
 - (3) Cushing's syndrome
 - (4) Adreno-genital syndrome
- D. NEUROGENIC
- (1) Brain
 - (a) Tumor
 - (b) Concussion
 - (c) Bulbar Poliomyelitis
 - (d) Encephalitis
 - (e) Meningitis
 - (f) Diencephalic syndrome
- E. VASCULAR
- (1) Coarctation of the Aorta
- II. SYSTOLIC HYPERTENTION (Increased Systolic Pressure Only)
- A. Due to Increased Cardiac Output
- (1) Complete Heart Block
 - (2) Aortic Insufficiency
 - (3) Patent Ductus Arteriosus
 - (4) Hyperthyroidism
 - (5) Arteriovenous Fistula
 - (6) Severe Anemia
 - (7) Paget's Disease
- B. Due to Decreased Elasticity of the Aorta
- (1) Arteriosclerosis of the Aorta
 - (2) Coarctation of the Aorta
-

*Actually the etiology of hypertension is unknown but a classification based on the main organ system involved in association with hypertension is of clinical value.

Selection Of Cases For Antihypertensive Drug Therapy

In the selection of patients for drug therapy, certain basic principles must be understood. It is generally agreed that a sustained reduction in diastolic pressure results in reduced cardiac work with subsequent improvement in cardiac function. Cardiac compensation is more easily maintained. Heart size may return to normal. A left ventricular hypertrophy pattern in the electrocardiogram may disappear. Improvement in retinal findings and renal function may occur. The rapid downhill course of "accelerated" or malignant hypertension can be controlled. By reducing blood pressure, the progressiveness of the arteriolar sclerosis may be reduced. However, rapid reduction in blood pressure also results in reduced blood flow, and increases the tendency to thrombosis, thus uremia, cerebral and coronary thrombosis can occur. Side-reactions as postural hypotension, constipation, unpleasant blurred vision, fatigue, impotence, dryness of mouth, nasal congestion, bizarre dreams, and depression, may accompany drug therapy. Even in the most enthusiastic hands, success in dropping blood pressure significantly with drug therapy is not predictable and may not occur in all treated patients. However, in well controlled series, the hazards are minimal and not serious. Thus the physician now has available a remarkable variety of drugs, all differing in their modes of action that have the capacity of reducing blood pressure effectively in a significant number of patients.

While it is not easy to place hypertensive patients in neat, rigid groupings nevertheless there are several groups about which there is no controversy concerning the advisability of administering hypotensive drugs.

Certainly any patient with malignant or the "accelerated" phase of essential hypertension can benefit from antihypertensive drug therapy. Schroeder¹⁰ has demonstrated marked benefits with therapy in this group.

Patients whose diastolic pressures are 110 mm of mercury or over and who have shown evidences of progressiveness after physical and laboratory examinations should receive specific drug therapy.

Patients with diastolic pressures between 100 and 110 mm of mercury are treated only if they exhibit clinical progressiveness and complications due to hypertensive cardiovascular disease. Evaluation of treatment in the milder hypertensives is not yet available but it seems reasonable to conclude that if the diastolic pressure can be maintained at about normal or slightly elevated pressure levels there should be improved cardiac and renal function and possibly reduced progressiveness in the associated vascular disease.

Patients whose diastolic pressures are below 100 mm of mercury probably require no specific therapy. Meilman¹¹ also feels that patients, particularly elderly ones, whose hypertension has proven benign by its long duration and who show only a moderate degree of cardiac enlargement, probably require no intensive therapy. However, it should be pointed out, that although certain older hypertensives may have a normal life span individual selection within the group is difficult and prediction of prognosis is uncertain.

Acute hypertensive crises associated with encephalopathy, toxemias of pregnancy, acute nephritis, and cerebro-vascular accidents can also benefit from therapy. We now have available for parenteral use hypotensive drugs which are reasonably prompt in reducing blood pressure.

There are also some absolute contraindications to the use of some of the new antihypertensive drugs. Recent coronary or cerebral thrombosis, and advanced renal insufficiency contraindicate vigorous, immediate therapy particularly with the ganglionic blocking agents. Obviously, an unintelligent and uncooperative patient makes this type of therapy also hazardous.

Hypotensive Drug Therapy

If it has been determined that a patient is to receive hypotensive drug therapy, the physician has to decide which particular drug to use. Criteria for this selection are controversial and only a trial can determine the effectiveness of any particular drug in any patient. It seems to be generally agreed that the use of a *Rawolfia* preparation is the initial drug of choice. It is unusually mild as regards toxicity, relieves anxiety, slows the pulse rate and appears to be synergistic with all other hypoten-

LABORATORY STUDIES

I. ROUTINE

- A. Blood pressure determination both arms, sitting, lying, and standing
- B. Palpation femoral artery pulsations. Blood pressure legs
- C. Complete blood count
- D. Urinalysis, chemical and microscopic. Dilution and concentration test
- E. Blood chemical studies (1) Urea Nitrogen (2) Fasting Blood sugar (3) Serum Sodium and Potassium (4) Cholesterol
- F. X-ray to determine cardiac contour and size
- G. Electrocardiogram
- H. Funduscope examination

II. Renal

- A. Intravenous and possibly retrograde pyelography
- B. Urine culture
- C. Blood chemical studies (1) Uric Acid (2) Calcium (3) Phosphorus (4) Alkaline and Acid Phosphatases (5) Total Proteins with Albumin and Globulin Ratio
- D. L-E cell preparation
- E. Congo red test
- F. Skin, muscle, gum biopsy
- G. Renal biopsy
- H. Excretion of sodium and water of each kidney. (Howard Test)
- I. Aortogram with visualization of renal arteries
- J. Radioactive diodrast renogram

III. Hormonal

- A. Regitine test
- B. Catechol amine determination in blood and urine
- C. 17-Ketosteroid, 17-oxysteroid, 17 hydroxycorticoid excretion
- D. Aldosterone excretion
- E. Perirenal air insufflation
- F. Serum sodium, potassium, chloride, carbon dioxide content and serum ph
- G. Protein bound iodine

IV. NEUROGENIC

- A. Skull x-ray, possible ventriculogram and/or cerebral arteriography
 - B. Spinal fluid pressure and chemical studies
 - C. Electroencephalogram
-

sive drugs. Its mode of action is presumably at the hypothalamic area where it inhibits sympathetic activity. Its effectiveness in reducing blood pressure is greatest in the mild, labile hypertensive. There are a wide variety of commercial *Rawolfia* preparations available. The crude root, standardized alkaloidal extracts and purified alkaloid have essentially similar pharmacologic properties as regards their hypotensive effectiveness. Reserpine, the pure alkaloid, has an average dose of 0.5 milligrams daily.

Satisfactory blood pressure reduction through the use of *Rawolfia* preparations occurs in only a small proportion of patients and the selection of additional medication poses a therapeutic problem. Either a veratrum preparation or apresoline can be tried. The former reduces blood pressure by a series of reflexes mediated via the chemoreceptors, and baroreceptors located in the carotid sinus, carotid body and myocardium. The narrow range between toxic and therapeutic doses and its mild hypotensive effects limits its usefulness. Apresoline, a true renal vasodilator, reduces blood pressure presumably by reducing peripheral resistance as a result of centrally induced peripheral vasodilation. It also increases cardiac rate and cardiac output. The latter qualities at times have resulted in an aggravation of an anginal syndrome and may make control of congestive heart failure hazardous. If total daily dosage is kept below 400 mgm. daily, serious toxicity is rare. Above this dosage a "lupus" like syndrome may occur in about 10% of treated patients. Apresoline has proven itself an effective hypotensive agent in mild to moderately severe hypertensive patients.

If drastic lowering of diastolic pressure is advisable, the use of the ganglionic blocking agents is indicated. Hexamethonium has been largely replaced by pentolinium tartrate (Ansolysem), chlorisondamine dimethochloride (Ecolid) and mecamlamine (Inversine). The principal effect of these drugs is believed to be a result of synapse blockade at both the sympathetic and parasympathetic ganglia. These agents vary in their absorbability and thus dosage and toxicity at times are unpredictable. For example, the absorption of Hexamethonium is 6%, Ansolysem, 22%, Ecolid, 22%. Inversine is believed to be totally absorbed and thus may be a more predictable agent. The effective dose of Inversine ranges from 5 to 25 mgm. daily, of Ansolysem, 60 to 500 mgm., of Ecolid, 25 to 200 mgm. of Hemamethonium 500 mgm. to 4 grams. The introduction of the ganglionic blocking agents should begin with very small oral doses and dosage increases should be determined by blood pressure responses in the upright position. It is preferable to record this pressure approximately two hours after the ingestion of medication. Initial dose of Inversine being 1.0 mgm. If no postural hypotension ensues two hours after administration, the dose should be doubled and given every 8 hours. Dosage then is increased by 2.5 mgm. every other day until the desired effect is obtained. Moyer¹² prefers dosages given at 7 AM, noon, 5 PM and 10 PM. The initial dose of Ansolysem is 10 mgm. The dose is increased by 20 mgm. slowly every other day until faintness in the up-

right position occurs. Three doses daily are given, generally after breakfast, in mid afternoon and at bedtime. Each dose need not be equal and study of the upright blood pressure responses at various times in the day indicate the desirability of making one dose larger than the other. The initial dose of Ecolid is 10 mgm. In view of its long duration of effectiveness Ecolid is repeated every 12 hours, generally being given after breakfast and supper. Dosage is increased 25 mgm. every other day until desired effect on pressure is obtained. Darvill¹³ has administered in severe hypertensives as much as 60 mgm. per day before considering Ecolid ineffectual.

Acceptance of ganglionic blocking medication is narrowed by the wide variety of undesirable side effects. Severe constipation, at times associated with true ileus occurs. Cascara, prostigmine, neostigmine, or enemas are often required for adequate bowel evacuation. Neostigmine may render the synapse blockade less effectual and thus is used only when urgently required. Impotence may be a major problem. Discontinuing the medication for a day often corrects this complaint. Blurred vision, dryness of the mouth, urinary retention are generally not too serious. Severe postural hypotension may respond to recumbency, but at times neosynephrine administration is advisable.

Acute encephalopathy responds to intravenous veratrum or intramuscular reserpine administration. One can also use Inversine, Ansoysem, or Hexamethonium intravenously. The greatest caution should be exercised under these conditions since the drop in blood pressure may be precipitous and uncontrollable.

Surgery

The Peet or Smithwick type of sympathectomy is now reserved for the patient with malignant hypertension unresponsive to intensive hypotensive drug therapy. It may be recommended to patients with malignant hypertension or severe hypertensives who for various reasons do not care to subject themselves to the careful regimen required by drug therapy. In general surgical sympathectomy has been superseded by medical sympathectomy. If surgical sympathectomy is unsuccessful in reducing blood pressure, drug therapy then may become effective.

Diet

Low sodium diets (200 mgm.) are effective in reducing blood pressure. These are unpalatable and are acceptable for only short periods of time. With the use of hypotensive drugs, strict adherence to severe sodium restriction is not essential.

Low fat, low cholesterol diets have been recommended to control atherosclerosis. These are still controversial since the etiology of atherosclerosis is unknown. If the blood cholesterol level is above normal then the use of this type of diet is probably advisable. Further studies regarding the relationship between diet and atherosclerosis will be required before being able to definitely establish its effectiveness.

Addendum:

Since the completion of this resume, Wilkins* has introduced the use of Diuril as a hypotensive agent. While its effectiveness may be related to its ability to augment sodium excretion, it has been demonstrated that in some patients hypotensive effects may occur without reduction in serum sodium or body weight. Diuril also makes the ganglionic blocking agents more effective presumably because it increases sodium excretion. The starting dose of Diuril is 125 mgm three times daily and maximal dose, 500 mgm three times daily.

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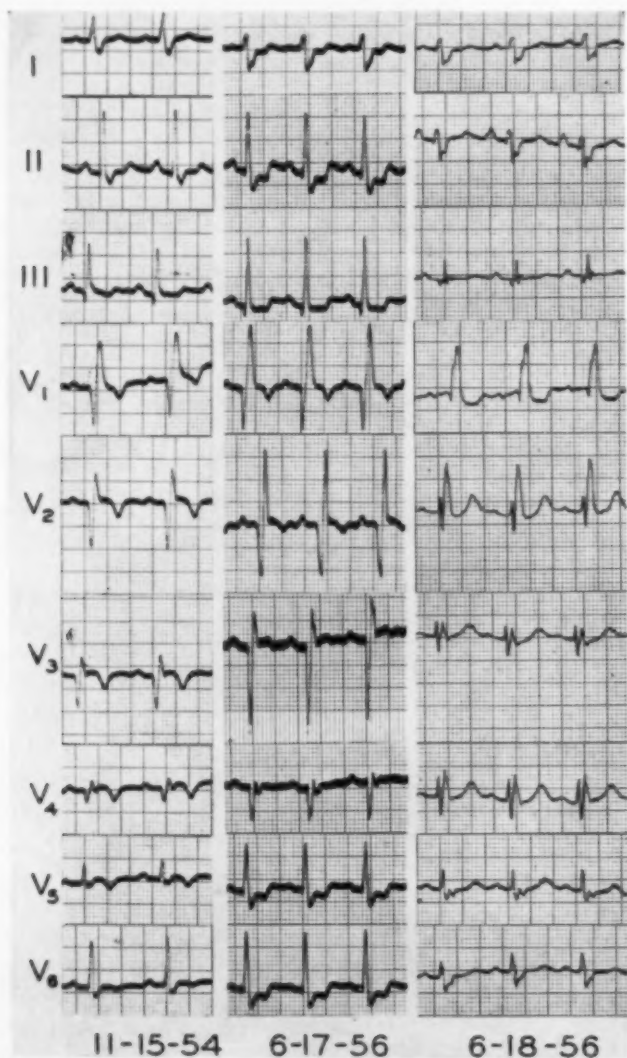
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THE ELECTROCARDIOGRAM OF THE MONTH

The authors would be pleased to receive comment and controversy from readers in relation to explanations offered.

This 67 year old man was hospitalized for three weeks in 1949 because of a "blood clot in the heart." In April 1954 he began having episodes of substernal pain radiating into his neck which were relieved by nitroglycerin. Electrocardiograms recorded in 1954 and 1955 were similar and one of these is shown below (November 15, 1954). Physical examination on admission to the hospital revealed



no abnormalities. An electrocardiogram made while he was having pain is also shown above (June 17, 1956). His pain was relieved by parenteral Demerol and another electrocardiogram was made on the following day.

Interpretation

The electrocardiogram made on November 15, 1954 shows right bundle branch block and an old anteroseptal myocardial infarction. The tracing made during an episode of chest pain on June 17, 1956 shows depression of the ST segment in leads I, II, III, and V5 and V6 and elevation of the ST segment in leads V2 and V3. These changes are indicative of posterior wall injury. The following day the injury shifts are no longer present. There is, however, a decrease in the height of the R waves in leads II and III and the large deep Q waves previously seen in leads V2, V3, and V4 are now preceded by R waves. Multiple precordial leads were made at various levels on June 18, 1956 to assure that the QRS changes seen were not due to a different placement of the chest electrodes.

The development of a posterior infarct in this patient resulted in an electrocardiogram which was not remarkable except for the presence of RBBB. If previous tracings were not available neither the fresh posterior infarction nor the old anterior infarction might have been suspected. The only suggestive feature seen in the tracing of June 18, 1956 is the large upright T wave in lead V2. The development of RBBB with an increase in the size of the R and/or R' waves in leads over the right anterior chest usually results in a proportional decrease in the size of the T wave in these leads. Thus the large T wave in lead V2 is suggestive although not pathognomonic of posterior ischemia.

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CASE REPORT SECTION

Coronary Embolism and Acute Myocardial Infarction Secondary to Rheumatic Heart Disease

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Rheumatic heart disease is not frequently considered a predisposing factor in the genesis of acute myocardial infarction. Coronary artery embolism is a diagnosis that is frequently not considered during life and is easily missed at the post mortem examination. The purpose of this article is to report and discuss a proved case of coronary artery embolism producing an acute fatal myocardial infarction in a patient with underlying rheumatic heart disease.

Case Report: A 64 year old white man entered the hospital for the first time on November 21, 1955. On the morning of admission, while in bed, he noted the sudden onset of crushing substernal pain which was extremely severe and radiated down the ulnar aspects of both arms. He felt quite weak and began to sweat profusely. At the same time, he noticed severe shortness of breath and appeared pale.

Past history was unremarkable. There were no known previous serious illnesses or operations. He had no known manifestation of rheumatic fever. System review and family history were non-contributory.

Physical examination at the time of admission to the hospital revealed a moderately obese man who was quite dyspneic and complained of severe chest pain. Temperature was 99° F., pulse 80, respiration 26 and blood pressure 170/106 mm. of mercury. There was no cyanosis, clubbing or edema. Neck vessels were not unusually prominent. The lungs were clear. The point of maximum intensity of the apex beat was diffuse and extended to the fifth intercostal space in the left mid-clavicular line. A faint right ventricular thrust was present. A-2 was louder than P-2 and the second pulmonic sound was finely reduplicated. The mitral first sound was normal and no murmur was detected. Heart tones were of poor quality.

Laboratory examination revealed the following data: Urinalysis showed a trace of acetone but was otherwise negative. Hemoglobin was 17.7 gms. White blood cell count was 15,700 cells cu./mm. with 57 per cent segmented neutrophils, 23 per cent unsegmented neutrophils, 3 per cent eosinophils, 15 per cent lymphocytes and 2 per cent monocytes.

An electrocardiogram taken on admission (Fig. 1) demonstrated the classical findings of a massive, acute antero-lateral myocardial infarction. An electrocardiogram taken two days later was essentially unchanged except that the rate had increased to 115, and premature atrial contractions were much more frequent.

After admission to the hospital, he was placed on bed rest and given supplementary oxygen. Morphine sulfate grains one quarter was administered frequently, but failed to completely control the pain. Additional therapy included papaverine grains 3, 4 times a day and dicumarol 100 mg. on three successive days. During the first four hospital days, his condition remained critical and he frequently complained of chest pain. At 2:00 A.M. on the morning of the fifth hospital day, he became restless; his blood pressure fell to 80/30 mm. of mercury and his skin became cool and clammy. At 4:00 A.M., he had a slight convulsion and was essentially non-responsive thereafter. At 9:20 A.M. he expired.

At autopsy, the body weighed 98 Kg. and measured 170 cm. The pleural cavities contained 150 cc. of straw colored fluid bilaterally. The pericardial sac was lined by roughened membranes over which were several layers of fibrin. The parietal and visceral pericardium contained multiple petechiae. The heart weighed 530 gms., and the myocardium appeared soft and flabby. The left ventricle was dilated and the left

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ventricular wall measured 1.5 cm. The right ventricular wall measured 0.5 cm. in thickness. The leaflets of the tricuspid and pulmonic valves were thin and delicate. The aortic cusps were minimally calcified, thickened and fused with one another. Over the free edges and the aortic surfaces were occasional calcified verrucous masses. Slight aortic stenosis was thought to be present. The mitral leaflets as well as the chordae tendineae were markedly thickened and fused. The mitral valve was definitely and significantly stenotic. There was dilatation of the right and left auricles, and the left auricular appendage was almost completely filled with a thrombus. The left coronary ostium was widely patent and appeared two to three times normal size. Both the circumflex and anterior descending branches of the left coronary artery were partially to completely occluded by embolic masses. The right coronary artery was hypoplastic. On section the myocardium of the anterior wall, septum, apex and adjacent sections of the posterior wall was grayish yellow and hemorrhagic in appearance. This was thought to represent an acute myocardial infarct.

The left lung weighed 330 gms. and the right 360 gms. The lungs were crepitant.

Microscopic examination of the heart revealed typical findings of an acute myocardial infarction approximately five days old. The wall of the left coronary artery was thin with minimal atheromatous changes. In the center of the vessel and completely occluding it was a solid fibrinous mass (Figure 2) consistent with the diagnosis of an embolus from the atrial appendage. The embolus appeared to be the same age on microscopic examination as the left atrial thrombus (Figure 3).

Discussion

The first case of coronary embolism was reported by Virchow¹ in 1856. In 1953 Cheng, Cahill, and Foley² collected a series of 54 proved cases. More recently individual cases have been described by Watts³ and Flake.⁴ Although there have been other reports, it is apparent that there have been relatively few documented cases of coronary embolization. Hamman⁵ estimates the incidence of coronary embolism to be 1 to 2 per cent of all coronary occlusions.

Based on the reported cases, there are several sources of the embolic material. In order of frequency they are: (1) Bacterial vegetations on the mitral and aortic valves due to bacterial endocarditis (2) mural thrombi

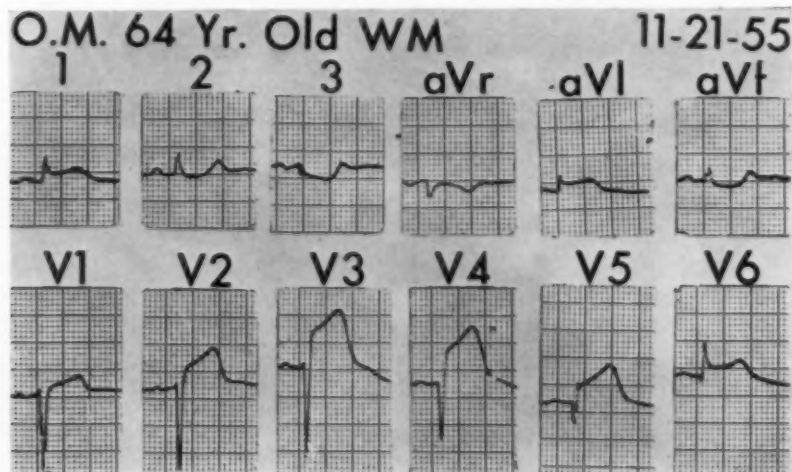


FIGURE 1: Electrocardiogram taken on admission. Tracing reveals typical findings of acute antero-lateral myocardial infarction.

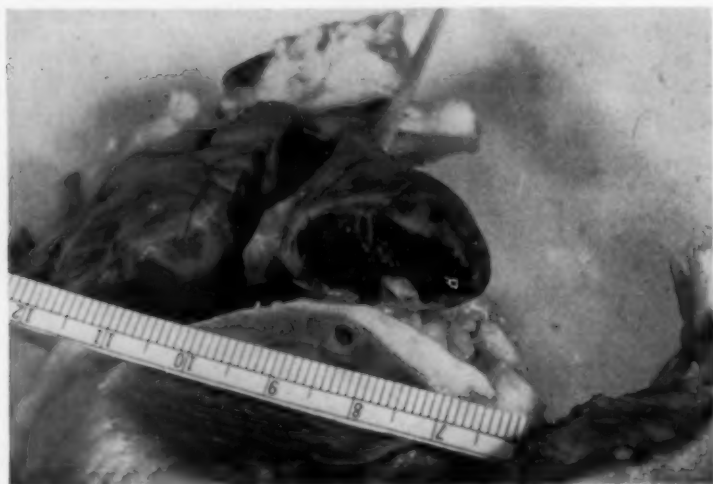


FIGURE 2: Thrombus in left atrial appendage. Below this is seen the intra-mural left coronary artery occluded by an embolus.

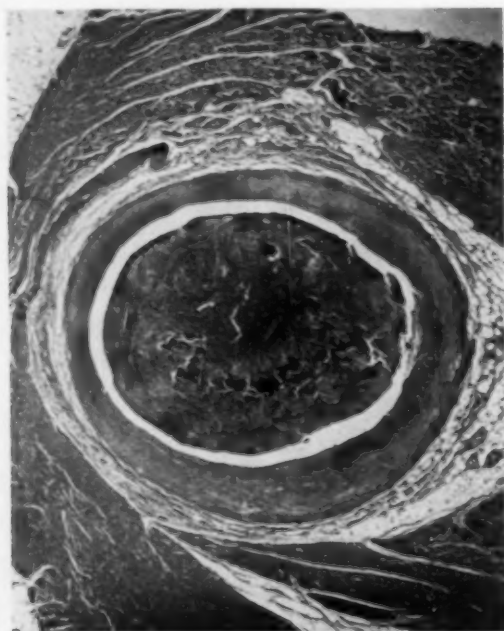


FIGURE 3: Left coronary artery. An embolus is clearly visualized with little or no attachment to the adjacent arterial wall. There are only minimal atherosclerotic changes in the wall of the artery itself.

on atherosclerotic or luetic lesions at the root of the aorta (3) intracardiac mural thrombi (4) thrombi in peripheral veins (paradoxical embolism) (5) thrombi in the pulmonary veins.

The difficulty in making an accurate ante mortem diagnosis of coronary embolism has been described by Hamman.⁵ Certain features, however, stand out in the reported cases. Bacterial endocarditis is a well known source of emboli, and the sudden appearance of a myocardial infarction in a patient with bacterial endocarditis should make one suspicious.⁶ Indeed, any cardiac patient or a patient with peripheral thrombophlebitis with sudden severe chest pain should alert the physician to the possibility of coronary embolism. Conditions that predispose to the formation of intracardiac thrombi, such as mitral stenosis, create the possibility of coronary emboli. Acute myocardial infarction in young individuals should also suggest the possibility of coronary embolism.

There are a number of post mortem findings in this case which help to definitely establish the pathological diagnosis of coronary embolism. The source of the embolus was clearly demonstrated in the left auricular appendage and the thrombus can be explained as being secondary to the rheumatic heart disease. In general, the arteriosclerotic changes in walls of the coronary arteries were minimal and were insufficient to explain the massive myocardial infarction on the basis of atherosclerosis.

Sections of the left coronary artery clearly showed this artery to have an intra-mural course. This anatomical variation was first described by Geiringer⁷ who concluded that the incidence of atheromatous change in these intra-mural vessels was much less than is normally seen in extra-mural arteries. Although this conclusion has not been substantiated by Edwards,⁸ certainly the left coronary artery in the present case showed minimal atheromatous changes. Another factor of importance in the present case is that the left coronary ostium was two to three times the normal size while the right coronary artery was hypoplastic thus resulting in a greater ease of embolization to the left coronary artery than would normally be present.

The diagnosis of rheumatic heart disease and coronary embolization probably could not have been made in this case prior to the patient's death, since there were none of the clinical criteria necessary for the ante-mortem diagnosis. Although the diagnosis of rheumatic heart disease with mitral stenosis was quite evident at autopsy, there was no suggestive history and no murmurs were detected. While the typical auscultatory findings may have been missed, this would seem to be unlikely, because of the repeated and frequent examinations of the patient. Mitral stenosis without murmurs does occur and has been described by Levine.⁹ He attributes this phenomenon primarily to decreased blood flow across the stenotic valve which might occur in shock, congestive failure, atrial fibrillation, or marked dilatation of the heart. The typical auscultatory findings are made more difficult to hear by such factors as pulmonary emphysema, obesity, fluid in the chest cavity, and distant heart sounds. Dilatation of the heart and shock may well have been important factors in the present case.

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Effect of Lateral Recumbency on Pulmonary Function

ZOLTAN MANN, M.D., F.C.C.P.

Alexandria, Louisiana

It is the general belief that in the lateral recumbent position, which is a frequent position during bed rest, the lower chest, the one which is in contact with the mattress, expands less and consequently its function is diminished. Several authors¹⁻⁶ have investigated this function by means of clinical observations, radiographical and spirometric examinations but the result of these investigations and the interpretations of the findings were contradictory.

Adams and Pillsbury¹ believed that the excursion of the lower hemidiaphragm had a greater respiratory efficiency. Webb, Foster and Gilbert² found the tidal movement of the lower hemidiaphragm greater than that of the upper; however, after an interval of about an hour it equalized. Contrary to this finding, Pierson and Newell,³ who made their investigations primarily in dogs, did not find the tidal ventilation to be equalized after a longer time.

Vaccarezza and his collaborators⁴ found increased oxygen consumption through spirometric determination, greater complementary air, and increased vital capacity of the recumbent lung on a person who maintained the same position for two weeks; however, they supposed that the recumbent lung is in elastic repose.

Rothstein, Landis and Narodic⁵ found spirometrically that oxygen consumption of the recumbent lung is increased. This finding was perplexing to them and they explained this increase as due to the larger capillary bed from relative congestion.

From the Veterans Administration Hospital.

Wade and Gibson⁶ found that the diaphragmatic excursion, measured by a special device, showed a slightly greater excursion of the lower diaphragm. They believed, however, that this increased excursion is not sufficient to increase the respiratory function because the expansion of the lower part of the thoracic cage is reduced.

The purpose of this investigation is to demonstrate, by clinical observations substantiated by radiographic findings, that the function of the recumbent lung is increased and the function of the upper lung is decreased. Spirometric tests were not done since the results of such physiological studies have been considered and presented by others.^{4,5}

Hypothesis, Method and Findings:

It was supposed that in lateral recumbent position the function of the upper lung is diminished because in this position the upper shoulder is caudad and the upper hip is cephalad and the arm usually rests on the chest wall. These factors exercise a splint-like action on the upper chest. The function of the lower lung is actually increased because the lower shoulder in this position is cephalad which pulls up the shoulder girdle and the hip is caudad. This permits maximum excursion of the ribs. This excursion is further facilitated by the fact that the patient is lying on two prominent bony structures—the hip and the shoulder. This position is illustrated in Figure 1. Mattresses exert some resistance against the lower chest but not enough to prevent the pulling action of the shoulder girdle where several secondary inspiratory muscles are attached. To substantiate this supposition by radiological findings, x-ray films in right lat-

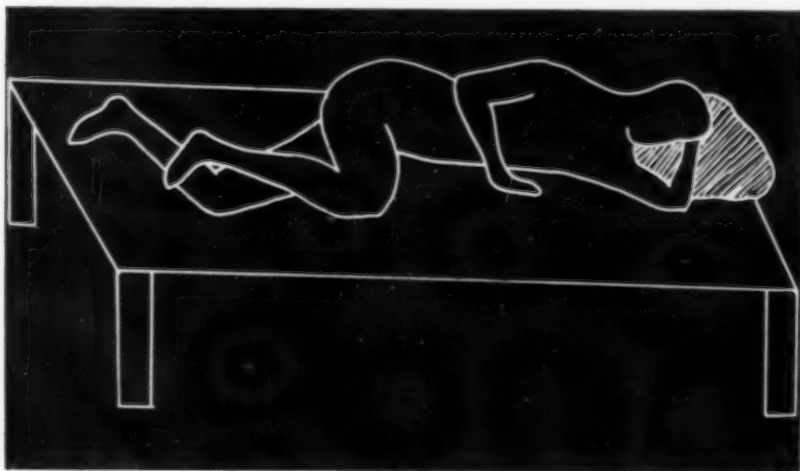


FIGURE 1: In lateral recumbent position, the upper shoulder is caudad; the upper hip is cephalad. The arm usually is leaning over the chest wall. The lower shoulder is cephalad and the lower hip is caudad. In this position the subject is lying on two prominent bony structures, that is, the hip and the shoulder.

eral decubitus were taken of a slender man (Figure 2), a slender woman, and a stout, short man in deep inspiration and full expiration. X-ray film was also taken of the stout, short man, in left lateral decubitus, for comparison. Roentgenogram in the upright position was also taken to show the physiological expansion of the chest and normal excursion of the diaphragm during the full phase of vital capacity (between full expiration and deep inspiration) (Figure 3).

All exposures were made from the standard six feet distance, the patient



FIGURE 2: Right lateral recumbent position in full expiration shows the right diaphragm at the level of the ninth posterior rib while the left is a little over the 11th. The same position in deep inspiration shows both diaphragms at the level of the 11th posterior rib. Note the marked airlessness of the right lung and the narrowing of the intercostal spaces in the expiration film.

lying in lateral recumbent position on a stretcher covered by a thin, one inch mattress.

It was found that in lateral recumbent position the hemi-diaphragm of the lower lung moved from the 11th posterior rib up to the ninth posterior rib between deep inspiration and full expiration, while the hemi-diaphragm of the upper lung hardly moved. In addition to this impressive finding, it could be seen that the under lung is markedly less aerated in expiration while the change in aeration of the upper lung is negligible. It can also be seen that in spite of the lower lung being in full expiration stage during deep expiration—as we can judge from the relative airlessness and the elevated diaphragm—the ribs of the lower thorax do not approximate correspondingly to the full expiration stage. This is the effect of the pulling action of the high shoulder girdle which does not permit the ribs to approximate and keeps the apical part of the lung in a constant anatomical expansion. Furthermore, it was evident that while the ribs over the under lung moved during respiration to a certain extent, in spite of the pull of the shoulder girdle, the ribs of the upper lung moved little or not at all. A marked shift of the mediastinum toward the recumbent side could be seen, especially on the plate of the young woman whose mediastinal structures are still elastic.

X-ray films of the short, stoutly built person show movement of the upper hemi-diaphragm. This moderate excursion of the upper chest wall is explained by the fact that the lower shoulder girdle and hip of this stout person are not so prominent; the lower chest leans over the mattress and consequently the upper shoulder and hip approach each other to a lesser extent permitting some excursion of the upper chest wall. The film of the slender woman showed the excursion of the lower hemi-diaphragm and the widening of the intercostal spaces even more pronounced. This is explained by taking into consideration that the hips of women are more prominent.

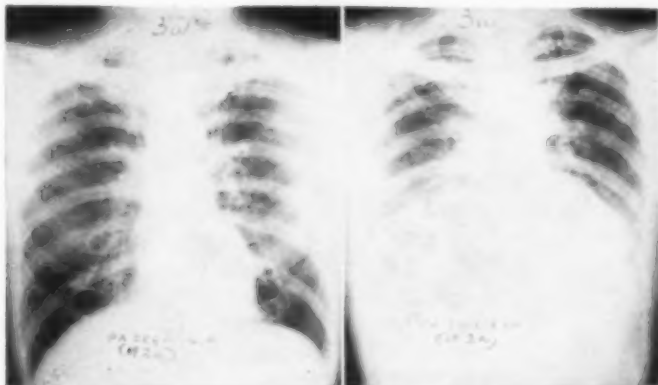


FIGURE 3: X-ray films taken in upright position of the same persons, show normal diaphragmatic excursion.

Comment

All of these findings, which are: the change of the intercostal spaces of the recumbent part of the chest wall, the change in aeration of under lung, the marked excursion of the lower hemi-diaphragm, the almost unchanging picture of the upper chest wall, lung field, and hemi-diaphragm, and the increased oxygen consumption of the under lung, clearly indicate that in the lateral recumbent position the function of the under chest wall, pleura, and lung increased, and of the upper is decreased.

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The Role of Medicine in World Peace

World peace is a hope that challenges the heart and mind. It is a desire that will be attained only by prodigious effort and by the will of man to understand the problems of his neighbor.

The theory is held by many that war is a biologic necessity and inevitable. The idea is not easily dislodged from the mind of man, for he has been indoctrinated with it through the centuries by advocates of the belief that "might makes right." War as a biologic necessity becomes absurd in the light of present-day scientific enlightenment, and the realization that to permit its occurrence is to court world destruction.

The struggle for world peace is a stupendous undertaking. It is an effort that requires the active participation of all members of society. The medical profession, because of its heritage and training in the alleviation of suffering, is especially destined to assume a place of leadership in this struggle. The well-informed physician appreciates that nations and customs change from time to time, but that the heart of man remains fundamentally the same. He is keenly aware of the importance of knowing the laws that govern the biologic organization of the individual and of human nature. Most important of all for the physician, his prerequisite of love of medicine must of necessity imply a love of humanity also.

History eloquently records that two of the dominant forces in the betterment of man have been religion and the healing art. That they should be so often associated in the mind of man as offering moral leadership is not surprising, for both are striving for the same purpose—the defense against evil. In ancient times disease, which is as old as life itself, was thought to be dealt with best by those chosen by the gods. With the dawn of reason and the casting aside of the fetters of superstition, knowledge became the criterion for the selection of the physician. But always a love of medicine has implied a love for humanity. These two qualities offer a basis for social leadership.

Statesmen have long recognized that physicians possess the qualifications essential in the production of leaders in the fight for peace, but deplore their reluctance to assume their proper place in world politics. They emphasize that physicians have the training and the close association to learn from the people their true hopes, aspirations, and degrees of fortitude, and that they are in a most favorable position to help direct the people's idealism into proper channels and implement it. Physicians are peculiarly qualified to judge the physical and, to a lesser extent, the mental capabilities of our leaders, and to warn the populace when disorders arise—disorders that so often may lead to tragedy and loss of human life and dignity. Medicine may indeed act as a catalyzing agent for better understanding among men, and a potent force against ignorance, which so often breeds evil.

Virchow, in 1849, forcefully described the responsibility that medicine must bear in order to assume its proper place in the life of man:

"Should medicine ever fulfill its greatest ends, it must enter into the larger political and social life of our time. It must indicate the barriers which obstruct the normal complications of the life cycle and remove them. Should this era come to pass medicine, whatever it may then be, will become the common good of all." There are many in the medical profession who are fully aware of medicine's responsibility to humanity, are motivated by the high ideals of public service, and give gladly of their time and substance to bring such dreams to a full fruition. Others believe they are willing to join in this great crusade but never succeed in implementing such a belief with action. Finally, there are those who lack a sense of responsibility to humanity and are content to spend their lives in self-satisfied isolation, with no altruistic regard for their fellow-man.

Medicine, which is science in the making, can no longer enjoy the luxury of provincialism; for science, as Pasteur noted, knows no country. Although the voice of a single physician raised in behalf of humanity on the international scene may not always be heard, when augmented by the many voices of his associates it may have far-reaching effects. It is important that we in the medical profession not only combine our voices on matters of local concern, but also unite with our colleagues all over the world in a concerted effort for the betterment of mankind. At every opportunity we must join with other guilds and organizations, and those of other nations and races in the crusade for peace, if peace is ever to have birth.

One of the most potent and successful methods for promoting good will and understanding among physicians throughout the world is the international medical meeting. Such meetings afford a splendid opportunity for the exchange of ideas and information. They rapidly teach that physicians and other people, no matter what their race, creed, or origin, have many of the same hopes and dreams, and that many of the apparent differences are mere misunderstandings based on ignorance. How refreshing and stimulating it is to realize that good ideals and ideas can come from so many!

The American College of Chest Physicians has been a pioneer in the promotion of international medical meetings and has aided greatly in the dissemination of medical knowledge and the promotion of better understanding among men. The next international meeting of the American College of Chest Physicians is to be held in Tokyo, Japan, in September of this year. Not only does it promise to be highly educational and instructive, but also it affords a splendid opportunity to enjoy the famous hospitality of an oriental nation. It should do much to promote international understanding and a realization that to know is not to fear, for knowledge and truth conquer all.

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The President's Page

The annual reunion of College members and their families is drawing near and I am sure we are all looking forward to a most successful and enjoyable meeting in San Francisco. A glance at the scientific program as published in the April issue of *Diseases of the Chest*, would suffice, I believe, to induce all chest specialists to attend. Our program committee has, indeed, organized a most outstanding array of scientific sessions.

At this time of the year it is important that the members of all the College councils and committees give serious thought to their respective activities and especially to their plans for the future. All of the councils and committees of the College will hold their annual meetings at the Fairmont Hotel, San Francisco, on Thursday, June 19, when present activities and future programs for each committee will be discussed.

It will be of interest to all members of the College, I know, to learn that there will be three special events in San Francisco sponsored by councils of the College. The first will take place on Wednesday afternoon, June 18, and is sponsored by the Council on Undergraduate Medical Education. The subject under discussion at this Seminar will be "Undergraduate Teaching of Tuberculosis and Chest Diseases at the University of California School of Medicine," in which members of the staff at the University will present their teaching methods. Questions and discussion from the floor will be welcome. College members concerned with undergraduate teaching will undoubtedly be able to glean some valuable ideas from this session.

Two special events will take place on Thursday afternoon, June 19. One will be an open forum of the Council on Research where reports from various committees will be presented. Except for one or two occasions, the meetings of the Council on Research have been closed sessions. However, the College membership has expressed great interest in hearing the reports of the committees which serve under the Research Council and it was decreed by the Board of Regents to open the session to all College members.

The other special event scheduled for Thursday afternoon, which we are certain will interest a great many members, is the Open Forum sponsored by our Council on Hospitals. This year the subject of the forum is "Have We Exhausted Our Case-Finding in Chest Disease?" A number of experts in this field will present their views as they relate to communities, hospitals, schools and penal and mental institutions. We are therefore of the opinion that an open discussion on this timely topic could be of great value. I hope you will find it so and that you will contribute to the discussion or ask questions which will bring out the pertinent points.

Following are a few of the highlights of the scientific assembly that you will not want to miss. The "Panel on the Jet Age and Chest Medicine" will be presented on Thursday night, June 19. The Fireside Conferences, Friday night, June 20, will offer twenty-eight simultaneous conferences covering almost every conceivable subject in chest disease. Each table will be manned by two or more experts and refreshments will be served to liven the discussion. There will be a selection of eighteen round table luncheon discussions presented on Friday, Saturday and Sunday, June 20-21-22. These luncheons are always sold out in advance of the meeting and I would suggest that you reserve places at the luncheons of your choice at once.

The Committee on Motion Pictures of the College, under the chairmanship of Dr. Paul H. Holinger of Chicago, has organized a splendid program of motion pictures on chest disease to be presented in San Francisco. I would like to call your attention to the new list of approved motion pictures compiled by the committee and published in this issue of the journal. Reprints of this list may be obtained upon request. It will be a pleasure to see you in San Francisco.

Burgess L. Gordon

College Chapter News

ILLINOIS CHAPTER

The 19th annual meeting of the Illinois Chapter will be held at the Hotel Sherman, Chicago, on May 22, in conjunction with the meeting of the state medical association. The following program will be presented:

- 8:30 a.m. Registration
9:00 a.m. Herman C. Rogers, Mt. Vernon, President, Illinois Chapter, presiding
"Bronchial Asthma Fifty Years Ago and Today"
Max Samter, Chicago
"Treatment of Hypertension"
Sibley W. Hoobler, Ann Arbor, Michigan
"Etiologic Factors in the Production of Lung Cancer"
Wilhelm C. Hueper, Bethesda, Maryland
12:00 noon Luncheon and business meeting

NEW YORK STATE CHAPTER

The 18th annual dinner meeting of the New York State Chapter will be held at the Hotel Statler, New York City, May 15. Dr. Chevalier L. Jackson, Philadelphia, will present the Eighth Annual Howard Lillienthal Lecture entitled "The Bronchologist's Role in Modern Thoracic Surgery." On May 16, the following program will be presented in the Chest Disease Section of the Medical Society of the State of New York:

- "Significance of Circulating Neoplastic Cells in Patients with Carcinoma of the Lung"
George E. Moore and Charles A. Ross, Buffalo
Discussion: Oscar Auerbach, East Orange, New Jersey and Herbert C. Maier, New York City
"Anatomic Studies of Coronary Arteries"
Allan Stranahan, Albany
Discussion: Simon Dack and Harry Gross, New York City
"Tracheal Fenestration as a New Method of Treatment of Advanced Emphysema"
Charles F. Blazsik, Edgar Mayer, Israel Rappaport, Edward E. Rockey and Samuel A. Thompson, New York City
Discussion: Ralph D. Alley, Albany and Alvan L. Barach, New York City

CUBAN CHAPTER

At the recent annual meeting of the Cuban Chapter in Havana, the following officers were elected:

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| President: | Luis P. Romaguera, Havana |
| Vice President: | Rogelio J. Barata, Havana |
| Secretary-Treasurer: | Rafael A. Gomez Zaldivar, Havana |

JAPAN CHAPTER

The Japan Chapter held a meeting in Tokyo on February 11 when the following program was presented:

- "Combined Chemical and Adrenocortex Hormone Therapy in Pulmonary Tuberculosis"
Jiro Gomi, Tokyo
"Tuberculosis Bronchiectasis"
Junjiro Okanishi, Tokyo
"Classification of Pulmonary Tuberculosis from the Standpoint of Chemotherapy"
Imazato Donomae, Osaka



Members, Japan Chapter, attending annual meeting February 11, 1958.

At the close of the scientific session, a business meeting was held at which the following officers were elected:

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|------------------------|------------------------|
| President: | Masanaka Terada, Tokyo |
| First Vice President: | Susumu Hibino, Nagoya |
| Second Vice President: | Harutaka Baba, Tokyo |
| Secretary-Treasurer: | Yoshio Hayashi, Tokyo |

COLLEGE GROUP INSURANCE PROGRAM EXTENDED TO MEMBERS THROUGHOUT THE WORLD

The Joseph K. Dennis Company, Inc. of Chicago, Illinois, administrators of the ACCP Group Insurance Program, reports to the College that the ACCP Accidental Death—Dismemberment—and Loss of Sight Insurance Program has been extended to include all of our members around the world and the spouse of the member, so long as they are age 70 or under.

This recent improvement in the ACCP Group Insurance Program has been accomplished without any increase in premiums or decrease in benefits.

The ACCP Accidental Death—Dismemberment—and Loss of Sight Program provides six plans of coverage to choose from ranging from \$25,000 to \$200,000. The group premium is at the rate of \$1.25 per \$1,000.

The coverage afforded in this program is in effect 24 hours a day, 365 days a year, anywhere in the world, at work, at home, at play. Coverage is also provided for any mode of travel, so long as it is a licensed carrier and the insured is not a pilot or crew member of an aircraft.

Members outside the U. S. may apply for coverage under the ACCP Accidental Death—Dismemberment—and Loss of Sight Program; however, their premiums are payable at the American currency exchange rate and claims are paid on the same basis.

This coverage provides maximum benefits at minimum group rates.

All inquiries concerning the ACCP Accidental Death—Dismemberment—and Loss of Sight Program may be directed to the ACCP Group Insurance Administration Office, the Joseph K. Dennis Company, Inc., Suite 1027, 175 West Jackson Boulevard, Chicago 4, Illinois.

College News Notes

Dr. A. Frederick Bloodworth, Gainesville, Georgia, recently addressed the Rotary Club of Gainesville on the scope of the specialty of diseases of the chest and the activities of the American College of Chest Physicians.

Dr. C. Walton Lillehei, Minneapolis, Minnesota, was recently named one of six recipients of the Purdue Frederick Medical Achievement Travel Award for outstanding medical and scientific activities.

Dr. Raffaele Paolucci de Valmaggione, Rome, Italy, has been made President-Elect of the International College of Surgeons and will assume office in September, 1958. **Dr. Jorge A. Taiana**, Buenos Aires, Argentina, was elected a Vice-President of the organization.

The following Fellows of the College participated in a panel discussion on "The Management of the Patient with Cardiovascular Disease" at a meeting of the Westchester Heart Association and the Westchester County Medical Society on February 18 at Purchase, New York: **Drs. Houck E. Bolton**, **William Likoff**, Philadelphia, and **Charles K. Friedberg**, New York City.

Dr. William R. Barclay, Chicago, Illinois, and **Dr. Edward H. Robitzek**, Staten Island, New York, spoke at the meeting of the New York Tuberculosis and Health Association in New York City, April 30.

A medical-surgical building in Minneapolis will be named for **Dr. George E. Fahr**, Minneapolis, in honor of his contributions to the development of the electrocardiogram.

Drs. George E. Burch, New Orleans, Louisiana, and **Robert P. Glover**, Philadelphia, Pennsylvania, were lecturers at the Atlanta Graduate Medical Assembly held recently.

Brig. General Carl W. Tempel, Phoenixville, Pennsylvania, was the winner of the Stitt Award for meritorious achievement in the use of antibiotics in the treatment of tuberculosis. The award was presented by **Dr. Jerome J. Van Gase** of the Chas. Pfizer Company.

Sir Harry Wunderly, Canberra, Australia, and **Dr. Robert T. Neubauer**, Ljubilijana, Yugoslavia, will participate in the NAPT Commonwealth Chest Conference to be held in London, July 1-4. They will speak on "The World Anti-tuberculosis Campaign. Is it Succeeding?"

During 1957, the following members of the College were guests of **Dr. Donato G. Alarcon** at the Sanatorio San Angel in Mexico City: **Jose Abello**, Madrid, Spain; **Andrew L. Banyai**, Milwaukee, Wisconsin; **Marvin S. Harris**, Los Angeles, California; **Meyer R. Lichtenstein**, Chicago, Illinois; **Leo G. Rigler**, Los Angeles, California; **Maurice S. Segal**, Boston, Massachusetts; **Harry Shubin**, Philadelphia, Pennsylvania; **Jose Valiente**, San Salvador, El Salvador; **Carlos Zurita**, Cordoba, Spain.

Dr. Edward A. Meyerding, St. Paul, Minnesota, has recently retired as Executive Secretary of the Minnesota Tuberculosis and Health Association after serving in this capacity for 34 years.

Dr. Clyde A. Watkins, Sanatorium, Mississippi, has been appointed Superintendent of the Mississippi State Sanatorium.

Drs. Carl Davis, Jr., **Kenneth C. Johnston**, **Hiram T. Langston**, and **William M. Lees**, Chicago, will serve on the Committee on Local Arrangements for the 1958 Congress of the American College of Surgeons to be held in Chicago, October 6-10. **Dr. John L. Keeley**, Chicago, will serve as Chairman of the Press Relations Committee. **Drs. Thomas G. Baffes**, Skokie and **Peter V. Moulder**, Chicago, will work with **Dr. Keeley**.

Dr. Nathaniel E. Reich, Brooklyn, New York, delivered several lectures at the Faculty of Medicine of Haiti, Port-au-Prince, at the invitation of the government of Haiti. While there, he met with **Dr. Francois Duvalier**, recently elected President of Haiti, and **Dr. Auguste Denize**, newly appointed Minister of Health in Haiti who is a Fellow of the College. The College Governor in Haiti is **Dr. Louis Roy**.

Committee on Motion Pictures American College of Chest Physicians

The Committee on Motion Pictures of the American College of Chest Physicians is pleased to present the following list of films on diseases of the chest. A previous list was published by our committee in 1953. Since then, many new films have been prepared and this current list, we hope, will assist College members in undergraduate and postgraduate teaching of diseases of the chest. The films appropriate for use in undergraduate teaching have been marked with an asterisk. The titles have been divided into various categories for ease in selection of films on special subjects. Requests for the loan of films should be directed to the indicated source. Copies of the list, including an author index, will be sent upon request.

Paul H. Holinger, Chicago, Illinois, Chairman
Houck E. Bolton, Philadelphia, Pennsylvania
Eliot Corday, Beverly Hills, California
Francis E. Donoghue, Rochester, Minnesota
Karl P. Klassen, Columbus, Ohio

List of Approved Films

ANATOMY, PHYSIOLOGY, EMBRYOLOGY AND BACTERIOLOGY

*COCCIDIOIDOMYCOSIS, ITS EPIDEMIOLOGIC AND CLINICAL ASPECTS

Libero Ajello and Roger Egeberg, directed by Mr. Graham Heid, Public Health Service and Veterans Administration, Washington, D. C.

Distribution and habitat of the fungus, *Coccidioides immitis*, are described. The epidemiology and clinical manifestations are shown, employing x-rays, animation and photography of actual cases. The serology and laboratory procedures for isolating the organism are treated in some detail since these are the most certain methods of diagnosis. Sound, color, 19½ minutes (1956). Procurable from Audio-Visual Section, Communicable Disease Center, Public Health Service, Chamblee, Georgia.

*BRONCHOVASCULAR ANATOMY

William E. Bloomer, A. A. Liebow and M. R. Hales, New Haven, Connecticut

Makes use of vinylite injection-corrosion casts of human lungs obtained at autopsy, to demonstrate the segmental bronchovascular anatomy of the lung. Sound, color, 25 minutes (1953). Procurable from William E. Bloomer, M.D., 789 Howard Avenue, New Haven, Connecticut.

*MECHANICAL FACTORS GOVERNING EXPIRATORY OBSTRUCTION TO AIRFLOW

Howard G. Dayman, Chronic Disease Research Institute, University of Buffalo School of Medicine, Buffalo, N. Y.

Mechanical model of bronchi and lung animated to act as the bronchi in life show the collapsing effect of low lung tension, high rate of flow and obstruction. Dead lungs attached to cough machine show same phenomena, also living structures in movies of the fluoroscopic screen. These factors are reflected in specific pneumotachograph patterns. Sound, color, 20 minutes (1954). Procurable from author, 993 Delaware Avenue, Buffalo 9, N. Y.

*DYNAMICS OF THE TUBERCLE, IN VIVO OBSERVATIONS OF PATHOGENESIS AND EFFECTS OF CHEMOTHERAPY IN THE CLARK RABBIT EAR CHAMBER

Robert H. Ebert and William R. Barclay, University of Chicago School of Medicine, Chicago, Illinois; directed by David S. Ruhe, University of Kansas School of Medicine, Lawrence-Kansas City, Kansas; original research supported by grants from the U. S. Public Health Service; produced with support from Chas. Pfizer & Co., Brooklyn, N. Y.

This film is a demonstration of pathology of tuberculosis as observed in living tissue. A brief prologue compares the familiar fixed and stained histopathology of tuberculosis with the appearance of these lesions in live tissue (where changes in the blood vessels are the dominant phenomena). The rabbit ear chamber of A. E. Clark is explained by means of live views and animated drawings. A sheet of replacement connective tissue forms in the chamber from the surrounding tissue, and the characteristic appearance of the normal vessels, blood cells and connective tissue in the chamber is demonstrated. The film concludes with a rapid summary of the salient features of the dynamics of tubercle formation. Sound, color, 28 minutes (1956). Procurable from Chas. Pfizer & Co., Brooklyn, N. Y.

*ANTI-TUBERCULOSIS DRUGS IN THE MEDICAL AND SURGICAL TREATMENT OF TUBERCULOSIS

H. Corwin Hinshaw and Albert C. Daniels, San Francisco, California

The film deals with benefits from and the limitations of the modern anti-tuberculosis drugs, such as PAS, streptomycin, dihydrostreptomycin and hydrazid. Sound, color, 28 minutes (1953). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

*Asterisk indicates film appropriate for undergraduate teaching.

***DEVELOPMENT OF THE AORTIC ARCH**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.

Beginning with the gill-arch apparatus of water-breathing vertebrates, the film shows the changes which occur in air-breathing mammals, making possible their efficient respiratory mechanism. In this evolutionary process, the development and involution of the primitive arches are carefully documented, up to the point, about the eighth week after ovulation, where the definitive arrangement of the great vessels has become established. With closure of the ductus arteriosus as respiration begins at term, the final, complex, asymmetrical pattern of the human aortic arch is established. Sound, color, 14 minutes (1956). Procureable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

***ANOMALIES OF THE AORTIC ARCH**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.

This film is best used as a sequel to its companion, *Development of the Aortic Arch*, which sets the stage, so to speak, for the presentation of the common deviations from the normal which are depicted here. With an understanding of the probable course of events resulting in situations with which the surgeon may be confronted, he should be better able to make accurate diagnosis and evaluate conditions where the surgical intervention will be advisable. Sound, color, 30 minutes (1956). Procureable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

***DEVELOPMENT OF THE HEART**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.

This subject is covered here entirely in animation. Normal development is depicted in detail, and from several aspects, in whole as well as in parts, from the 3rd to the 11th week (ovulation age) after which changes are those of size only. Sound, color, 35 minutes (1958). Procureable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

***THE BRONCHOPULMONARY SEGMENTS**

Chevalier L. Jackson, John F. Huber and Charles M. Norris, Temple University School of Medicine and Hospital, Philadelphia, Pennsylvania

The film demonstrates that by inflation of fresh lung specimens and by means of dye injection, the anatomist can delimit individual segments, which he further identifies by dissection. Embryologically, each of the segments is represented by a bronchial bud. Histologic sections provide additional evidence that the segments are discrete entities. Sound, color, 30 minutes (1955). Also Available with French, German and Spanish sound tracks. Procureable from Chas. Pfizer & Co., 630 Flushing Avenue, Brooklyn 6, N. Y. and from the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***ACTION OF THE HUMAN HEART VALVES**

Karl P. Klassen and C. V. Meckstroth, Ohio State University Health Center, Columbus, Ohio

Film shows the function of normal and abnormal heart valves under simulated physiological conditions. Correction of valvular dysfunction by surgery illustrated. Sound, color, 20 minutes (1956). Procureable from author, American College of Surgeons, 40 East Erie Street, Chicago 11, Illinois, or from American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***PRINCIPLES OF RESPIRATORY MECHANICS**

Jere Mead, E. P. Radford, Jr., M. B. McIlroy, B. G. Ferris, Jr. and J. L. Whittenberger, Department of Physiology, Harvard Medical School, Boston, Massachusetts

Sound, color, 22 minutes (1955). Procureable from American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***BCG VACCINATION AGAINST TUBERCULOSIS**

National Tuberculosis Association, New York, N. Y., and Research Foundation, Chicago, Illinois

A physician explains the approved role of BCG vaccination in a complete tuberculosis control program and reviews the recommendations of the American Trudeau Society for the use of BCG vaccine. This physician presents the results of carefully controlled studies in the United States and some results from elsewhere throughout the world. The film, by actual demonstration, describes the administering of the tuberculin test and its reading. In an actual BCG vaccination he shows how freeze-dried BCG is prepared for use, and demonstrates the multiple puncture disc method of vaccination. Sound, color, 20 minutes (1954). Procureable from Research Foundation, 70 West Hubbard Street, Chicago 10, Illinois.

***RECORDING OXIMETERS AND THEIR APPLICATIONS**

John F. Perkins, Jr. and William E. Adams, University of Chicago School of Medicine, Chicago, Illinois

The film begins with a picture of a Van Slyke apparatus during an analysis of blood for oxygen. The narrator makes the point that, in spite of the accuracy of the apparatus, continuous data regarding blood-oxygen content are not provided. The principles of oximeters are then briefly reviewed by means of a photoelectric exposure meter and transparent containers containing red and blue dyes to simulate oxygenated and reduced blood. Oximeter earpieces are shown, and various types of recording oximeters are demonstrated in use during teaching of respiratory physiology during various tests of pulmonary function, during an operation for valvulotomy, during an operation for pulmonic stenosis with atrial septal defect, and during post-operative oxygen therapy. Sound, color, 15 minutes (1953). Procureable from American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***CONGENITAL MALFORMATIONS OF THE HEART (PART I: DEVELOPMENT OF THE NORMAL HEART)**

Robert F. Rushmer and Richard J. Blandau, University of Washington, Seattle Washington

Actual development of the heart of a chick embryo. Animated drawings show the development and closure of the cardiac septa and the spiral septum. Sound, color, 15 minutes (1952). Procurable from The Film Center, University of Washington, Seattle 5, Washington, and from the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***CONGENITAL MALFORMATIONS OF THE HEART (PART II: ACYANOTIC CONGENITAL HEART DISEASE)**

Robert F. Rushmer, University of Washington, Seattle, Washington

Instances of a number of congenital lesions of the heart and great vessels, grouping them under a single clinical yardstick of absence of cyanosis and under the physiological criterion of anomalies where blood flow from left heart to right heart is paramount. Sound, color, 14 minutes (1952). Procurable from The Film Center, University of Washington, Seattle 5, Washington, and from the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***CONGENITAL MALFORMATIONS OF THE HEART (PART III: CYANOTIC CONGENITAL HEART DISEASE)**

Robert F. Rushmer, University of Washington, Seattle, Washington

Cyanosis in congenital heart disease, roles of (a) diminished blood through the lungs, and (b) shunting of venous blood into the systemic circulation. Includes tricuspid atresia, tetralogy of Fallot, Eisenmenger complex, persistent truncus arteriosus, and complete transposition of the great vessels. Differential diagnosis and principles of surgical therapy of these conditions. Sound, color, 30 minutes (1953). Procurable from The Film Center, University of Washington, Seattle 5, Washington, and from the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***CARDIAC ARRHYTHMIAS**

Robert H. Shuler, Mark F. Hance, Richard Shaw and David MacDougal, University of Chicago School of Medicine, Chicago, Illinois

A series of typical cardiac arrhythmias in experimental animals of the same types as encountered in clinical practices. Animations of abnormalities and typical EKG's shown. Silent, 30 minutes (1949). Procurable from Abbott Laboratories, North Chicago, Illinois.

***THE RECOGNITION AND MANAGEMENT OF RESPIRATORY ACIDOSIS**

Reginald H. Smart, Hurley L. Motley and Joseph F. Boyle, University of Southern California School of Medicine, Los Angeles, California

This film depicts patients with respiratory acidosis whose condition is aggravated by injudicious treatment. Film then depicts the pathologic physiology involved and finally demonstrates the methods of treatment based upon physiologic principles. Sound, color, 30 minutes (1957). Procurable from Smith, Kline and French Laboratories, Philadelphia, Pennsylvania.

***MOVEMENTS OF THE CARDIAC VALVES AND ORIGIN OF HEART SOUNDS**

H. L. Smith and H. E. Essex, Mayo Clinic, Rochester, Minnesota

Cardiac, aortic and pulmonic valves of isolated perfused heart of dog are shown in normal and slow motion. Simultaneous ECG and phonocardiographic records accompany activities of heart and valves. First and second sounds of heart are presented on sound track. Comments are on printed subtitles. Sound, color, 20 minutes (1955). Procurable from Mayo Clinic, Rochester, Minnesota.

ANESTHESIA**ETHER ANALGESIA FOR CARDIAC SURGERY**

Joseph F. Artusio, Jr., New York Hospital, Cornell University Medical College, New York, N. Y.

This film demonstrates a technique which makes it possible to maintain a patient in analgesia throughout major cardiac surgery. Sound, color, 28 minutes (1955). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

THE TECHNIC OF PERIDURAL ANESTHESIA FOR THORACIC SURGERY

Oral B. Crawford, Springfield, Missouri

This film portrays the technic of administering and managing peridural anesthesia in patients undergoing thoracotomy. Sound, color, 15 minutes (1953). Procurable from Astra Pharmaceutical Products, Inc., 7½ Neponset Street, Worcester, Massachusetts.

***ENDOTRACHEAL ANESTHESIA**

Charles F. McCuskey, Los Angeles, California

Sound, color (1949). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York 22, N. Y.

EXTREMELY LIGHT ANALGESIA PLUS MUSCLE RELAXATION FOR MAJOR CARDIAC SURGERY

Seymour Schotz, Presbyterian Hospital, Philadelphia, Pennsylvania

Demonstrates the use of nitrous-oxide-oxygen analgesia and "Anectine" brand succinylcholine chloride in major cardiac surgery. Sound, color, 30 minutes (1956). Procurable from Burroughs Wellcome & Company, Inc., 1 Scarsdale Road, Tuckahoe 7, N. Y.

CARDIOVASCULAR SYSTEM

SURGICAL SECURITY DURING PATENT DUCTUS TRANSECTION

Osler A. Abbott, Emory University School of Medicine, Emory University, Georgia
Brief summary of history and methods used. X-ray case demonstration late leak of suture line by usual Fott's method. Diagrams of methods used. Outline of rationale for same. Demonstration of technique by color film. Salient points in operation on human case. Silent, color, 18 minutes (1956).
Procurable from author.

ETHER ANALGESIA FOR CARDIAC SURGERY

Joseph F. Artusio, Jr., New York Hospital, Cornell University Medical College, New York, N. Y.
(See Anesthesia).

EXCISION OF POSTINFARCTION VENTRICULAR ANEURYSM

Edward E. Avery, Thomas W. Shields, Robert Hohf, Victor Bernhard and Craig Borden, Chicago, Illinois

The film illustrates the management of a patient with a large ventricular aneurysm following myocardial infarction. There is a brief description of history and physical findings and x-ray films are shown. The actual operation is shown whereby the neck of the aneurysmal sac is closed with multiple parallel mattress sutures, the sac excised, oversewn. Sound, color, 11 minutes (1956).
Procurable from Edward E. Avery, M.D., 260 East Superior Street, Chicago 11, Illinois.

*TRANSPOSITION OF THE GREAT VESSELS

Thomas G. Baffes, and Willis J. Potts, Children's Memorial Hospital, Chicago, Illinois
Describes surgical technique for correcting transposition of the great vessels. Sound, color, 45 minutes (1958). Procurable from American College of Surgeons, 40 East Erie Street, Chicago, Illinois.

*THE SURGICAL TREATMENT OF MITRAL STENOSIS

Charles P. Bailey and Houck E. Bolton, Bailey Thoracic Clinic, Hahnemann Medical College and Hospital, Philadelphia, Pennsylvania

The indications, contraindications for mitral commissurotomy, the preoperative and postoperative heart sounds and demonstration by means of the oscilloscope, electrocardiograms, x-ray findings, as well as the operative demonstration on autopsy specimens, and an actual operative procedure being carried out. Sound, color, 40 minutes (1954). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

THE SURGICAL CORRECTION OF AORTIC STENOSIS

Charles P. Bailey and Houck E. Bolton, Bailey Thoracic Clinic, Hahnemann Medical College and Hospital, Philadelphia, Pennsylvania

The transventricular approach for the surgical correction of aortic stenosis of rheumatic origin is demonstrated on an autopsy specimen and actual operative procedure is presented. The indication, the contraindications, preoperative heart sounds, as well as postoperative heart sounds are presented. The typical brachial artery pressure curves, x-ray findings and electrocardiographic findings are also presented. Sound, color, 40 minutes (1954). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

*RESUSCITATION FOR CARDIAC ARREST

Claude S. Beck, University Hospitals, Cleveland, Ohio

Unpredictable cardiac arrest occurs several times each year in every large hospital. The purpose of this film is to help formulate a plan of action for such an emergency by presenting the basic principles of what might be called a "cardiac resuscitation fire drill." It illustrates, on a dog heart, the steps in resuscitation of a heart in either standstill or in ventricular fibrillation. Sound, color, 19 minutes (1956). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

*SURGICAL TREATMENT OF CORONARY ARTERY DISEASE

Claude S. Beck, and David Leighninger, University Hospitals, Cleveland, Ohio

Illustrates electrical instability of the heart on a dog heart. An operation for the surgical treatment of coronary artery disease is demonstrated on a dog's heart and then on a human heart. The Mautz-Gregg Backflow method is demonstrated. Plastic-embedded and cleared hearts are shown. Sound, color, 28 minutes (1955). Procurable from Kenneth B. Wolfe, 2109 Adelbert Road, Cleveland, Ohio.

*PULMONARY ARTERIOVENOUS FISTULA

Albert Behrend, and Samuel Baer, Albert Einstein Medical Center, Yeshiva University, New York, N. Y.

Film showing a preoperative diagnostic study and multiple lobectomies in a case of pulmonary arteriovenous fistula involving both lungs. Silent, color, 20 minutes (1949). Procurable from Albert Behrend, M.D., 265 South 17th Street, Philadelphia, Pennsylvania.

*CREATION OF AN ARTIFICIAL DUCTUS IN THE TREATMENT OF TETRALOGY OF FALLOT

Alfred Blalock, Baltimore, Maryland

This demonstrates the creation of an artificial ductus arteriosus in the surgical treatment of tetralogy of Fallot. The surgical therapy consists of an anastomosis between the right subclavian artery and the right pulmonary artery, thereby sending some of the improperly oxygenated blood in the aorta, to the lungs. Sound, color, 32 minutes (1953). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

*SURGICAL TREATMENT OF TETRALOGY OF FALLOT

Alfred Blalock, Baltimore, Maryland

Shows an operation in which an anastomosis is performed between the right subclavian artery and the right pulmonary artery in the treatment of a six-year-old child with tetralogy of Fallot. Sound, color, 32 minutes (1954). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

***BRONCHOVASCULAR ANATOMY**

William E. Bloomer, A. A. Liebow and M. R. Hales, New Haven, Connecticut
(See Anatomy, etc.)

THE SURGICAL CORRECTION OF INTERATRIAL SEPTAL DEFECTS

Houck Bolton, Charles P. Bailey, and Henry Nichols, Bailey Thoracic Clinic, Hahnemann Medical College and Hospital, Philadelphia, Pennsylvania

The indications and contraindications for a closed method of the treatment of interatrial septal defects called *atriosepto-plexy* is presented. The surgical technic is demonstrated and the results of such a method of surgical repair are discussed. Sound, color, 27 minutes (1957). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

SURGICAL TREATMENT OF COARCTATION OF THE AORTA

David P. Boyd and H. D. Adams, Lahey Clinic, Boston, Massachusetts

Introduction to subject with x-rays and highlights of operative problems including approach exposure and technique of resection and repair. Silent, color, 20 minutes (1956). Procurable from Lahey Clinic, 605 Commonwealth Avenue, Boston 15, Massachusetts.

***SURGICAL TREATMENT OF CONGENITALLY ABSENT AORTIC ARCH**

J. Maxwell Chamberlain, Roosevelt Hospital, New York, N. Y.

The film shows a congenitally absent aortic arch with only two vessels to the head and neck in a patient with hemiplegia from cerebral hypertension. A new arch was substituted. Patient is now three years postoperative and is participating in athletics. Silent, color, 10 minutes (1954). Procurable from author, 23 East 79th Street, New York, N. Y.

***THE USE OF SHUNTS IN AORTIC ARCH DISEASE**

J. Maxwell Chamberlain, Fort Hamilton Veterans Hospital and Roosevelt Hospital, New York, N. Y.

This film has to do with resection of aneurysms of the arch of the aorta. Cerebral circulation is often embarrassed by surgery in this area and therefore shunts taken from 255 lb. pigs were used to by-pass the arch of the aorta in order to resect the aneurysms. Silent, color, 20 minutes (1955). Procurable from author, 23 East 19th Street, New York, N. Y.

***THE HEART: ELECTROKYMOGRAPHY, VENOUS CATHETERIZATION AND ANGIOCARDIOGRAPHY**

W. Edward Chamberlain, Philadelphia, Lewis Dexter, Boston, and Marcy L. Sussman, New York

Sound, color, 28 minutes (1951). Procurable from G. D. Searle & Company, P. O. Box 5110, Chicago 80, Illinois.

SURGICAL REMOVAL MYXOMA LEFT AURICLE SIMULATING MITRAL STENOSIS

Denton A. Cooley and George C. Morris Jr., Baylor University College of Medicine, Houston, Texas

Myxoma of the left auricle is the most common intracavitary tumor of the heart. This lesion may produce findings similar to mitral stenosis and diagnosis is usually made at exploratory cardiomy. This film demonstrates successful removal of two such lesions in patients in whom a diagnosis of mitral stenosis had been made prior to operation. Sound, color, 15 minutes (1958). Procurable from Baylor University College of Medicine, Houston 25, Texas.

REPAIR AORTICO-PULMONARY SEPTAL DEFECT DURING CARDIOPULMONARY BY-PASS

Denton A. Cooley, Baylor University College of Medicine, Houston, Texas

Aortico-pulmonary septal defect or aortic window is an uncommon lesion producing left to right circulatory shunt. In the past surgical treatment has presented a formidable mortality. This film presentation demonstrates the use of a pump oxygenator and cardiopulmonary by-pass for safe conduct of operative correction of this defect. Sound, color, 16 minutes (1957). Procurable from Baylor University College of Medicine, Houston 25, Texas.

EXTRACORPOREAL CIRCULATION IN SURGICAL TREATMENT OF VENTRICULAR AND ATRIAL SEPTAL DEFECTS

Denton A. Cooley and Joseph R. Latson, Baylor University College of Medicine, Houston, Texas

Film demonstrates a method of cardiopulmonary by-pass for open heart surgery using a pump oxygenator. Two types of bubble diffusion oxygenator are shown, one a disposable plastic device and the other made of stainless steel. Induced cardiac arrest using potassium citrate is demonstrated for repair of ventricular septal defects and repair of atrial defects is also shown. Sound, color, 22 minutes (1957). Procurable from Baylor University College of Medicine, Houston 25, Texas.

CLOSURE OF ATRIAL SEPTAL DEFECT UNDER HYPOTHERMIA

Denton A. Cooley, Baylor University College of Medicine, Houston, Texas

Surgical repair of atrial septal defect may be accomplished by both closed and open cardiac techniques, depending upon certain anatomic physiologic features of the lesion. Although in simple defects located in a high septal position, closed methods are effective and satisfactory, in many instances repair under direct vision is desirable and occasionally necessary. This film demonstrates the method of open cardiomy under general body hypothermia for repair of an atrial defect in a ten-year-old girl with temporary caval inflow occlusion. Sound, color, 11 minutes (1954). Procurable from author.

METHODS OF SURGICAL TREATMENT OF PULMONIC STENOSIS

Denton A. Cooley and Dan G. McNamara, Baylor University College of Medicine, Houston, Texas.

This film demonstrates several methods of surgical treatment of congenital pulmonic stenosis and explains the method of selection of the method based upon anatomic findings in the heart. Closed transventricular valvulotomy, hypothermia, and cardiopulmonary by-pass are shown with a description of technic for each method. Sound, color, 18 minutes (1956). Procurable from Baylor University College of Medicine, Houston 25, Texas.

TOTAL EXCISION OF THE AORTIC ARCH FOR ANEURYSM

Denton A. Cooley and Michael E. DeBaakey, Baylor University College of Medicine, Houston, Texas

The film demonstrates a method of excision of total aortic arch using temporary shunts sutures to ascending aorta, descending aorta and carotid arteries. After excision and replacement of the arch with a graft, the shunt was removed. Sound, color, 17 minutes (1955). Procurable from Baylor University College of Medicine, Houston 25, Texas.

CLOSURE OF INTERVENTRICULAR SEPTAL DEFECT UTILIZING CARDIAC ARREST

Philip Crastnopol, Alvin A. Bakst, H. Gianfrenesco, E. A. Braunstein and Irving G. Kroop, Jewish Hospital of Brooklyn, Brooklyn, New York

The film demonstrates the surgical technique for the closure of ventricular septal defects. This includes cannulation of the canal and subclavian artery; the production of cardiac arrest; the repair of the defect; and the resumption of normal cardiac rhythm. Silent, color, 12 minutes (1958). Procurable from Alvin A. Bakst, M.D., 135 Eastern Parkway, Brooklyn, New York.

***SURGICAL TREATMENT OF DISSECTING ANEURYSM**

Michael E. DeBaakey, Denton A. Cooley and Oscar Creech, Jr., Baylor University College of Medicine, Houston, Texas

This film is concerned with surgical treatment of dissecting aneurysm of the aorta. Two cases are presented illustrating the two most common forms of the disease: First, the type in which dissection begins in the ascending aorta; second, the type in which dissection begins at or below the level of the left subclavian artery. Clinical manifestations and diagnostic features for both conditions are presented. The technique of the surgical procedure employed in each case is illustrated in detail, including diagrammatic drawings to emphasize the special technical features of the problem. Sound, color, 18 minutes (1955). Procurable from Baylor University College of Medicine, Houston 25, Texas.

***ANEURYSMS OF THE ABDOMINAL AORTA. SURGICAL CONSIDERATIONS BASED UPON ANALYSIS OF 350 RESECTED CASES**

Michael E. DeBaakey, Denton A. Cooley and E. Stanley Crawford, Baylor University College of Medicine, Houston, Texas

This film is concerned with surgical considerations of aneurysms of the abdominal aorta based upon experience with 350 cases treated by resection and replacement by aortic homografts and various plastic substitutes. Certain characteristic clinical, pathologic, and diagnostic features of these aneurysms are presented and illustrated. Emphasis is placed upon technical considerations in the resection and replacement of the aneurysm showing the use of both aortic homografts and prosthetic tubes made of plastic materials such as nylon and dacron. The indications and contraindications to operation and the factors influencing mortality are also presented. Sound, color, 26 minutes (1957). Procurable from Baylor University College of Medicine, Houston 25, Texas.

***THORACOABDOMINAL ANEURYSM INVOLVING CELIAC, SUPERIOR MESENTERIC AND RENAL ARTERIES. RESECTION AND HOMOGRAFT REPLACEMENT**

Michael E. DeBaakey, Oscar Creech, Jr., Denton A. Cooley and George C. Morris, Jr., Baylor University College of Medicine, Houston, Texas

This film portrays the resection of an aneurysm of the thoracoabdominal aorta involving the celiac, superior mesenteric and renal arteries. The method by which the aneurysm is resected and replaced with a homograft with restoration of continuity to these major branches is illustrated both by animated diagrams and by views of the actual operative procedure. Sound, color, 21 minutes (1957). Procurable from Baylor University College of Medicine, Houston 25, Texas.

SURGICAL TREATMENT OF SACCIFORM ANEURYSMS OF ASCENDING AORTA, TANGENTIAL EXCISION OF LATERAL AORTORRHAPHY

Michael E. DeBaakey and Denton A. Cooley, Baylor University College of Medicine, Houston, Texas

Excisional treatment of aortic aneurysms is the method of choice wherever conditions permit its satisfactory application. The actual surgical approach, however, varies, depending upon the nature and location of the lesion. This film demonstrates a method suitable for sacciform aneurysms of the ascending aorta without necessitating interruption of aortic flow. Sound, color, 15 minutes (1955). Procurable from Baylor University College of Medicine, Houston 25, Texas.

CLOSURE OF CONGENITAL INTERAURICULAR SEPTAL DEFECT BY THE "CIRCUMCLUSION TECHNIC OF SONDERGAARD"

Paul T. DeCamp, New Orleans, Louisiana

An anatomical dissection as shown and a clinical operation recorded to demonstrate the anatomy and the operative technique of this method of closure of congenital interauricular septal defects. Sound, color, 17 minutes (1956). Procurable from author, Ochsner Clinic, 3505 Prytanis Street, New Orleans 15, Louisiana.

EARLY PERICARDECTOMY IN TUBERCULOSIS PERICARDITIS

R. A. Dillard and Rex B. Perkins, Veterans Administration Hospital, Birmingham, Alabama

This film emphasizes the place of early pericardectomy in the effusive stage of tuberculous pericarditis. A patient illustrating this is shown, including preoperative study, operation and post-operative course. Sound, color, 20 minutes (1956). Procurable from Veterans Administration Central Office, Vermont Avenue and H Street, N.W., Washington 25, D. C.

ELECTIVE CARDIAC ARREST

Donald B. Effler, Laurence K. Groves and Harold F. Knight, Jr., Cleveland Clinic Foundation, Cleveland, Ohio

Pictorial description of the Melrose technique for elective cardiac arrest with potassium citrate and clinical examples. Sound, color, 20 minutes (1957). Procurable from Cleveland Clinic Foundation, 2020 East 93rd Street, Cleveland 6, Ohio.

CLOSURE OF INTERVENTRICULAR SEPTAL DEFECT USING THE PUMP OXYGENATOR

J. L. Ehrenhaft, State University of Iowa Hospitals, Iowa City, Iowa

Closure of an interventricular septal defect in an eight-year-old boy is shown. The extracorporeal machine is a DeWall type pump oxygenator. The operative procedure, open cardiomy, closure of interventricular septal defect using coronary return, in this instance is beautifully demonstrated. The extracorporeal circuit is also shown in a schematic manner. The method of cannulation of superior and inferior venae cavae and left subclavian artery is well demonstrated. Silent, color, 14 minutes (1956). Procurable from author.

CLOSURE OF INTERATRIAL SEPTAL DEFECT USING HYPOTHERMIA

J. L. Ehrenhaft, State University of Iowa Hospitals, Iowa City, Iowa

Closure of large ostium secundum defect in a fourteen-year-old girl. The technique of cooling in an ice bath, thoracotomy, open cardiomy, closure of interatrial septal defect under direct vision and rewarming of the patient is shown. Silent, color, 14 minutes (1956). Procurable from author.

SELECTIVE CARDIAC ARREST IN OPEN HEART SURGERY

William H. Falor, Clifford Boeckman and John Vallee, Akron, Ohio

In the authors' laboratory, in open right heart surgery employing an extracorporeal circuit for periods in excess of 30 minutes, a significant decrease in survival follows if the beating heart is arrested by potassium. Cardiac arrest, however, may be mandatory for the repair of certain defects. Selective cardiac arrest reconciles the increased potential survival of nonarrest techniques with the occasional necessity for arrest methods. In the technique of selective cardiac arrest exploratory right cardiomy are made with the heart beating. Readily reparable lesions are treated without arrest; less accessible lesions or those obscured by hemorrhage are repaired after arrest is induced. The movie outlines the rationale for, and depicts the technical production of selective cardiac arrest. Sound, color, 11 minutes (1957). Procurable from William H. Falor, M.D., 159 South Main Street, Akron 8, Ohio.

***CARDIAC ARREST: ITS PREVENTION, RECOGNITION AND TREATMENT**

Egbert H. Fell and Lowell Peterson, Chicago, Illinois

The film shows graphically the effects to the heart of an obstructed airway and the importance of an open airway with free exchange of gases. Sound, color, 17 minutes (1953). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

COMMISSUROTOMY OF MITRAL STENOSIS

Carmelo Gil-Turner, Grupo Sanatorial de Santa Marina, Bilbao, Spain

This film shows the practice of a commissurotomy for mitral stenosis, performed through anterior thoracic incision and the dilatation of the valve by introducing the index finger in the left auricle. The type of valvulotomy used when necessary is also shown. Silent, color, 15 minutes (1954). Procurable from author, Clinica F. San Sebastian, Rafaela de Ybarra 25, Deusto-Bilbao, Spain.

THE MITRAL VALVE—DYNAMIC PATHOLOGY AND SURGERY

Robert P. Glover, Julio C. Davila and Robert G. Trout, Philadelphia, Pennsylvania

The film demonstrates the action of the mitral valve in normal and disease states. An attempt is made to point out mechanical impairments resulting from rheumatic heart pathology compared to the normal. It includes demonstrations of techniques for surgical correction of mitral stenosis and insufficiency. Sound, color, 14 minutes (1957). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

THE ANATOMIC BASIS FOR THE SURGICAL CORRECTION OF MITRAL INSUFFICIENCY

Robert P. Glover, Julio C. Davila and Robert G. Trout, Philadelphia, Pennsylvania

This film attempts to elucidate visually the anatomic alterations affecting the mitral valve which leads to mitral insufficiency. The various surgical techniques for the correction of mitral insufficiency are illustrated indicating the anatomic and mechanical effectiveness of each. These pictures are taken by photographing the valve of autopsy specimens while the ventricular contraction is simulated by means of a mechanical pulse duplicator. Sound, color, 13 minutes (1957). Procurable from Medical Illustrator, The Presbyterian Hospital, 39th Street and Powelton Avenue, Philadelphia, Pennsylvania.

***SURGICAL MANAGEMENT OF MITRAL STENOSIS COMPLICATED BY PERIPHERAL EMBOLI**

Alfred Goldman, Beverly Hills, California

Film contains history of a patient, his x-rays, operation, gross pathology, microscopic pathology of specimen and auricle and thrombus. Technique of obtaining direct pressures of left auricle, left ventricle, and pulmonary veins is also included. Pre- and post-operative cardiac catheterization study is included. Follow-up x-rays and follow-up of patient. Film is documented by slow motion taken at 200 frames per second of atrial flutter and auricular fibrillation. Silent, color, 26 minutes (1952). Procurable from author, 416 North Bedford Drive, Beverly Hills, California.

CARDIAC BY-PASS AND ELECTIVE ARREST WITH AUTOGENOUS OXYGENATION

James A. Helmsworth, William R. Cole, James Neely and Ralph Shabetai, University of Cincinnati College of Medicine, Cincinnati, Ohio

The technique of cannulation is given for complete cardiac by-pass. Autogenous oxygenation is made possible by innovations in pulmonary artery cannulation and pulmonary vein drainage. The Melrose technique is employed for arrest with potassium citrate. Exploration of the heart is demonstrated through incision in the right ventricle. (The film is concerned entirely with experimental work in progress). Silent, 15 minutes (1957). Procurable from James A. Helmsworth, M.D., 3231 Burnet Avenue, Cincinnati 29, Ohio.

***DEVELOPMENT OF THE AORTIC ARCH**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.

(See Anatomy, etc.)

***ANOMALIES OF THE AORTIC ARCH**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.

(See Anatomy, etc.)

***DEVELOPMENT OF THE HEART**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.
(See Anatomy, etc.)

***PATENT DUCTUS ARTERIOSUS—PHYSIOLOGY, DIAGNOSIS AND CLINICAL CONSIDERATIONS**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.
This film is in two parts. The first part shows physiologic and diagnostic factors illustrated by animated diagrams. The second part shows the diagnosis and surgical correction of a case. Sound, color, 25 minutes (1952). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

***SURGICAL TREATMENT FOR CONGENITAL PULMONARY VALVULAR STENOSIS**

George H. Humphreys II, New York, N. Y.
Pulmonary valvulotomy (Brock's procedure) is shown as performed on a seven-year-old child with valvular stenosis. Sound, color, 20 minutes (1951). Procurable from Sturgis-Grant Productions, Inc., 322 East 44th Street, New York, N. Y.

***TECHNIQUES IN ANGIOGRAPHY**

A. W. Humphries, Cleveland, Ohio

The film is divided into two parts: Part I demonstrates the techniques of aortography, and Part II the techniques of femoral arteriography. Each section follows the same pattern of demonstration of equipment, demonstration of procedure by animation, demonstration of procedure in actual practice, and illustrative angiograms, and, finally, a listing of the equipment required. Sound, color, 14 minutes (1957). Procurable from author, 2020 East 93rd Street, Cleveland 6, Ohio, or American College of Surgeons, 40 East Erie Street, Chicago 11, Illinois.

SURGICAL CORRECTION OF CYANOSIS DUE TO INSERTION OF LEFT SUPERIOR VENA CAVA INTO LEFT AURICLE

Elliott S. Hurwitt, Montefiore Hospital, New York, N. Y.
Cyanosis due to insertion of a large systemic vein into the left auricle is corrected by ligation of the anomalous vessel. Silent, color, 6 minutes (1955). Procurable from author.

***FUNCTION OF THE MITRAL VALVE IN SITU**

Elliott S. Hurwitt and Adrian Kantrowitz, Montefiore Hospital, New York, N. Y.
Shows slow motion views of the mitral area in situ, free of blood while artificial heart takes on function of left heart. Sound, color, 13 minutes (1952). Procurable from the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

RESECTION OF ANEURYSM OF THORACOABDOMINAL AORTA

Elliott S. Hurwitt, Montefiore Hospital, New York, N. Y.
An Aneurysm of the thoracoabdominal aorta, including the celiac and superior mesenteric arteries, with rupture into the pericardium, was resected and replaced by a homograft. A temporary by-pass shunt was employed. Sound, Color, 7 minutes (1956). Procurable from author.

***TETRALOGY OF FALLOT**

John C. Jones, University of Southern California School of Medicine, Los Angeles, California

First, the anatomic features of tetralogy of Fallot are explained by a series of medical illustrations of the embryonic development of the heart. Then two operations using the Blalock-Taussig procedure are shown, and two using the Potts-Smith anastomosis. Sound, color, 33 minutes (1954). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York 22, N. Y.

***ACTION OF THE HUMAN HEART VALVES**

Karl P. Klassen and C. V. Meckstroth, Ohio State University Health Center, Columbus, Ohio
(See Anatomy, etc.)

CLOSURE OF INTERVENTRICULAR SEPTAL DEFECT WITH INDUCED CARDIAC ARREST

Conrad R. Lam, Thomas Gahagan, Charles Sergeant and Edward Green, Henry Ford Hospital, Detroit, Michigan

The film shows the closure of a large interventricular septal defect in a seven-year-old boy. Open cardiomy is carried out during cardiac by-pass with a pump-oxygenator of the bubble type. Before the ventriculotomy, cardiac arrest is produced by the injection of acetylcholine into the aorta, from which it passed into the coronary arteries. Sound, color, 25 minutes (1956). Procurable from Conrad R. Lam, Henry Ford Hospital, Detroit, Michigan.

LEFT HEART CATHETERIZATION

G. H. Lawrence, Mason Clinic, Seattle, Washington

Technic, indications and interpretation of percutaneous trans-thoracic left catheterization. Color, 10 minutes (1957). Procurable from author, 1118 Ninth Avenue, Seattle, Washington.

***THE ANATOMICAL CORRECTION OF THE TETRALOGY OF FALLOT DEFECTS UNDER DIRECT VISION, UTILIZING THE PUMP OXYGENATOR**

C. Walton Lillehei, Richard A. DeWall, Herbert E. Warden and Richard L. Varco, University of Minnesota Medical School, Minneapolis, Minnesota

This film shows the complete correction of the tetralogy of Fallot defects utilizing open cardiomy with the pump oxygenator. Closure of the ventricular septal defect and correction of the pulmonic stenosis by infundibular resection and pulmonary valvulotomy is portrayed. The pump oxygenator utilized is portrayed and induced cardiac arrest was utilized to facilitate the reparative surgery. This tetralogy patient also had an unusual associated defect, a ruptured aneurysm of the sinus of Valsalva, the repair of which is shown. Sound, color, 24 minutes (1957). Procurable from Audio-Visual Service, University of Minnesota, Minneapolis, Minnesota.

***MITRAL COMMISSUROTOMY**

John L. Madden, St. Clare's Hospital, New York, N. Y.

This film shows the technic for "finger-fracture" of a stenotic mitral valve orifice, a procedure which the author has found to be of value in selected cases. Sound, color, 25 minutes (1952). Procurable from E. R. Squibb & Sons, 745 Fifth Avenue, New York, N. Y.

***A SIMPLE OPERATION FOR CORONARY INSUFFICIENCIES**

M. S. Mazel, Edgewater Hospital, Chicago, Illinois

This film shows the pathology of coronary occlusion, as well as the technique of operation and how the procedure increases the blood supply of the myocardium by formation of a granulomatous pericarditis which acts as a source of collateral blood supply from the pericardial and epicardial regions. Silent, color, 30 minutes (1956). Procurable from author, 5790 North Ashland Avenue, Chicago 26, Illinois.

***A SIMPLE OPERATION FOR REVASCULARIZATION OF THE MYOCARDIUM IN CORONARY HEART DISEASE**

M. S. Mazel, Edgewater Hospital, Chicago, Illinois

The film demonstrates the modification of Dr. Thompson's technique of revascularization of the myocardium for ischemia due to coronary heart disease by means of distributing U.S.P. talc (magnesium silicate) within the pericardium. Indications for this operation are enumerated and electrocardiograph tracings of cases operated are demonstrated; as well as histological sections of normal pericardium, revascularized pericardium and autopsy specimens of patients dying of other causes, having been revascularized by this method. Silent, color, 30 minutes (1954). Procurable from author, 5790 North Ashland Avenue, Chicago 26, Illinois.

***ROENTGEN DEMONSTRATION OF MITRAL AND AORTIC INSUFFICIENCY**

Howard L. Moscovitz and Robert J. Wilder, Mt. Sinai Hospital, New York, N. Y.

Radiopaque dye is injected into the left side of the heart and extremely rapid (48 frames per second) motion picture films are made of a fluoroscopic screen whose image is intensified one thousand times. The reflux of dye through incompetent mitral and aortic valves is shown in addition to the details of normal valve function. Silent, 10 minutes (1956). Procurable from Howard L. Moscovitz, M.D., Mt. Sinai Hospital, 1 East 100th Street, New York 29, N. Y.

***CHRONIC CONSTRICTIVE PERICARDITIS**

Emil A. Naclerio, Harlem and Columbus Hospitals, New York, N. Y.

The etiology, pathogenesis and various pathologic types of chronic constrictive pericarditis are briefly considered. The major diagnostic features of an elderly woman who was operated upon are briefly discussed. The operative procedure and result are shown. The operative technique in the same patient is shown. Silent, color, 18 minutes (1948). Procurable from author, 25 East 35th Street, New York 16, N. Y.

***CONGENITAL PULMONARY STENOSIS WITH INTACT INTERVENTRICULAR SEPTUM**

Willis J. Potts, William L. Riker and Stanley Gibson, Children's Memorial Hospital, Chicago, Illinois

Diagnostic features are briefly set forth and the pathology is illustrated. The operative technic of transventricular valvulotomy and dilatation of the stenosed pulmonary valve is pictured in detail. Silent, color, 32 minutes (1953). Procurable from American College of Surgeons, 40 East Erie Street, Chicago, Illinois.

***AORTIC PULMONARY ANASTOMOSIS FOR PULMONARY STENOSIS**

Willis J. Potts, Children's Memorial Hospital, Chicago, Illinois

The salient points for a diagnosis of tetralogy of Fallot are reviewed. The technique of aortic pulmonary anastomosis is illustrated in detail and clarified by animation. Silent, color, 27 minutes (1949). Procurable from American College of Surgeons, 40 East Erie Street, Chicago, Illinois.

***SURGICAL DIVISION OF THE PATENT DUCTUS ARTERIOSUS**

Willis J. Potts, Children's Memorial Hospital, Chicago, Illinois

This film reviews briefly the symptoms of patent ductus. Most of the emphasis is placed upon the technique of division and suture of the ductus by means of the Potts toothed clamps. Silent, color, 25 minutes (1951). Procurable from American College of Surgeons, 40 East Erie Street, Chicago, Illinois.

CONGENITAL DIVERTICULUM OF THE LEFT VENTRICLE

Willis J. Potts and Arthur DeBoer, Children's Memorial Hospital, Chicago, Illinois

An unusual case of congenital diverticulum of the left ventricle protruding in the epigastric space is pictured. The operative procedure of removing the diverticulum and closing the stump of the ventricle is shown. Recovery was complete. Silent, color, 17 minutes (1952). Procurable from American College of Surgeons, 40 East Erie Street, Chicago, Illinois.

A SYNDROME OF CONGENITAL DEFECTS INVOLVING THE ABDOMINAL WALL, DIAPHRAGM, STERNUM, HEART AND PERICARDIUM

Mark M. Ravitch, The Johns Hopkins School of Medicine, Baltimore, Maryland

The film shows the correction of the ventral defect in a patient representative of the specific syndrome in which there are associated congenital defects including a ventral abdominal defect, a split or deficient lower sternum, a deficient anterior and central portion of the diaphragm, a deficiency of the distal half of the pericardium and an interventricular septal defect. Silent, color, 15 minutes. Procurable from author.

***RIGHT HEART CATHETERIZATION**

Mr. James Reske and Paul S. Mahoney, University of California School of Medicine, Los Angeles, California

Heart catheterization procedure specifically directed to x-ray and laboratory technicians, general practitioners and medical students. Sound, color, 19 minutes (1957). Procurable from Du Pont Company, Los Angeles, California.

***CONGENITAL MALFORMATIONS OF THE HEART (PART I: DEVELOPMENT OF THE NORMAL HEART)**

Robert F. Rushmer and Richard J. Blandau, University of Washington, Seattle, Washington

(See Anatomy, etc.)

***CONGENITAL MALFORMATIONS OF THE HEART (PART II: ACYANOTIC CONGENITAL HEART DISEASE)**

Robert F. Rushmer, University of Washington, Seattle, Washington

(See Anatomy, etc.)

***CONGENITAL MALFORMATIONS OF THE HEART: (PART III: CYANOTIC CONGENITAL HEART DISEASE)**

Robert F. Rushmer, University of Washington, Seattle, Washington

(See Anatomy, etc.)

***EXTREMELY LIGHT ANALGESIA PLUS MUSCLE RELAXATION FOR MAJOR CARDIAC SURGERY**

Seymour Scholtz, Presbyterian Hospital, Philadelphia, Pennsylvania

(See Anesthesia.)

***VALVULOTOMY FOR VALVULAR PULMONIC STENOSIS, DIRECT VISUAL PROCEDURE WITH HYPOTHERMIA**

H. William Scott, Jr., Nashville, Tennessee

Sound, color, 26 minutes (1955). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

BY-PASS AORTIC POPLITEAL GRAFT

Andrew G. Sharf, Glendale, California

The purpose of this movie is to demonstrate utilization of by-pass aortic graft in patients with chronic obliterative arterial disease. It demonstrates the value of preoperative arteriogram, showing both the value of preoperative arteriogram, showing both the aorta and distal arteries of the lower extremities. The movie also shows anastomosis of the popliteal arteries prior to performance of the entire procedure. It illustrates the importance of preservation of each collateral vessel in the dissection of the main artery and the site of anastomosis. The utilization of modified hypothermia for this type of surgery is indicated, and the method of utilizing a previously prepared homograft is demonstrated. For the sake of expediency, surgery is performed by two teams. Silent, color, 13 minutes (1956). Procurable from author, 932 South Central Avenue, Glendale 4, California.

CARDIOPNEUMOPEXY: A SURGICAL METHOD OF REVASCULARIZATION OF THE ISCHEMIC MYOCARDIUM

Franklin R. Smith, Seattle, Washington

The first portion shows the experimental data and technic and then two operations on patients are depicted, showing the technical steps in carrying out a cardiopneumectomy. There is adequate description of the indications and results. Silent, color 24 minutes (1956). Procurable from author, 942 Medical Dental Bldg., Seattle, Washington.

***MOVEMENTS OF THE CARDIAC VALVES AND ORIGIN OF HEART SOUNDS**

H. L. Smith and H. E. Essex, Mayo Clinic, Rochester, Minnesota

(See Anatomy, etc.)

***HEART CATHETERIZATION AND RADIOANGIOGRAPHY**

F. Mason Sones, Jr., Cleveland Clinic Foundation, Cleveland, Ohio

Films taken with image amplifier at 50-54 frames per second demonstrate catheterization and selective cardiography in all major cyanotic and non-cyanotic congenital heart lesions. Silent, 40 minutes (1956). Procurable from author.

***PROCEDURES IN THE DIAGNOSIS OF CARDIOVASCULAR DISEASE**

University of Southern California School of Medicine, Los Angeles, California

This film for the general medical profession, interns, and medical students, takes a patient from initial physical examination through a complete diagnosis. Using x-ray photography, it reviews all the latest techniques of cardiovascular diagnosis. Cardiac catheterization, vectorcardiogram, phonocardiogram, ballistocardiogram, besides the usual cardiac diagnostic technique, are demonstrated in the film. Sound, color, 22 minutes (1952). Procurable from University of Southern California, Los Angeles 7, California.

PERICARDIOTOMY FOR CONSTRICTIVE PERICARDITIS

Allan Stranahan, Ralph D. Alley and Harvey W. Kausel, Albany Hospital and Medical College, Albany, N. Y.

Classical case of constrictive pericarditis with total pericardiectomy via a bilateral, trans-sternal thoracotomy approach. Silent, color, 16 minutes (1955). Procurable from Allan Stranahan, M.D., Albany Medical College, Albany, N. Y.

PULMONARY ARTERIOVENOUS ANEURYSM

Lawrence H. Strug and William Leon, New Orleans, Louisiana

The film portrays a patient who has an arteriovenous aneurysm of the right middle lobe of the lung. It also shows pictures of the patient, x-rays and the degree of cyanosis which occurred, as well as preoperative angiocardiogram and oxygen studies. The operative procedure is shown, and the pulsations of the aneurysm well demonstrated. X-rays, blood oxygen studies and the patient are shown postoperatively. Sound, color, 17 minutes (1955). Procurable from American College of Surgeons, 40 East Erie Street, Chicago 11, Illinois.

VISUAL REPAIR OF CONGENITAL AORTIC AND PULMONARY STENOSIS

Henry Swan, Denver, Colorado

Open operation on the stenotic aortic and pulmonary valves of two patients is demonstrated and the methods discussed. Sound, color, 22 minutes (1957). Procurable from author, 4200 East 9th Avenue, Denver, Colorado.

VISUAL SURGERY IN THE OPEN HEART DURING HYPOTHERMIA**Henry Swan, Denver, Colorado**

Shows patient being cooled in a tub of ice water in preparation for open heart surgery. Three such procedures are demonstrated. Sound, color, 26 minutes (1953). Procurable from author, 4200 East Ninth Avenue, Denver 7, Colorado.

CARDIAC ARREST*Henry Swan and J. Cuthbert Owens, Denver, Colorado**

A typical episode of cardiac arrest occurring in the operating room, together with the method of management of this acute catastrophe, is demonstrated. Silent, color, 30 minutes (1953). Procurable from Henry Swan, M.D., 4200 E. 9th Ave. Denver Colorado, and Medical Audio Visual Institute, 185 North Wabash Avenue, Chicago, Illinois.

MITRAL COMMISSUROTOMY**John V. Thompson and E. R. Eaton, Methodist Hospital, Indianapolis, Indiana**

The film demonstrates the anatomy and the technique of mitral commissurotomy. Sound, color, 10 minutes (1957). Procurable from John V. Thompson, M.D., 7899 Ridge Road, Indianapolis, Indiana.

CONVERSION OF THE AURICULAR APPENDAGE INTO A LEAK-PROOF VALVE TUBE FOR INTRACARDIAC SURGERY*Samuel A. Thompson, New York Medical College, New York, N. Y.**

Actual operation upon experimental animals showing conversion of auricular appendage into a two-way valve. Silent, color, 20 minutes (1951). Procurable from New York Medical College, New York, N. Y.

CLOSURE OF VENTRICULAR SEPTAL DEFECT UNDER VISION USING DE WALL OXYGENATOR**Richard L. Varco, University of Minnesota, Minneapolis, Minnesota**

This material describes the technical aspects involved in direct vision closure of a ventricular septal defect using a bubble-type oxygenator. The precise cannulations and intracardiac steps are detailed so that by means of the narration and the close-up photography, the individual manipulations are clearly represented. Sound, color, 18 minutes (1956). Procurable from Audio Visual Education Service, University of Minnesota, Minneapolis 14, Minnesota.

PERIPHERAL CIRCULATION-PLETHYSMOGRAPHIC OBSERVATIONS*Travis Winsor, Los Angeles, California**

A short dissertation on the history of the peripheral circulation is presented along with a rather detailed study of modern methods for studying the status of the circulation. Plethysmographic tracings and their meanings are discussed. The value of the plethysmograph as another means to study the adequacy of the peripheral circulation prior to other operative procedures and the use of this instrument are vividly portrayed. Sound, color, 25 minutes (1957). Procurable from Ciba Pharmaceutical Products Inc., 556 Morris Avenue, Summit, New Jersey and Ideal Pictures Corporation, 58 East South Water Street, Chicago 1, Illinois.

CLOSURE OF ATRIAL SEPTAL DEFECT IN THE BLOODLESS HYPOTHERMIC HEART*Helge B. Wulff, Knut Haeger and Björn Sjöström, Malmö General Hospital, University of Lund, Malmö, Sweden**

The film shows closure of a large atrial septum defect in a girl aged twelve. The body temperature was reduced to 28° C. in a thermobox. The thorax was opened by a transverse incision in the fourth intercostal space with splitting of the sternum. The azygos vein was ligated, the superior inferior vena cava and lung hilum were clamped. After the right auricle had been opened and the diagnosis checked by insertion of a finger the incision in the auricle was closed. Stay sutures were placed in the right atrium. The atrial wall was clamped and the atrium incised. The superior inferior vena cava and lung hilum were then occluded and sixty seconds later the aorta and the pulmonary artery. The atrium was opened and the septal defect sutured with seven silk stitches. The atrial wall was then sutured and blood gradually allowed to enter after removal of the clamps occluding the aorta and the pulmonary artery. Electrocardiograms and diagrams of the blood potassium level and pH-values during the operation are shown. The patient is demonstrated. Silent, color, 13 minutes (1956). Procurable from Malmö General Hospital, Malmö, Sweden.

ESOPHAGUS**ESOPHAGEAL REPLACEMENT UTILIZING COLON AND JEJUNAL INTERPOSITION****Osler A. Abbott and William H. Sewell, Emory University School of Medicine, Emory University, Georgia**

Outline of problem emphasizing long-term complications from esophagogastronomy. Diagrammatic representation of technical steps in a) use right colon in substernal tunnel to replace entire thoracic esophagus, b) use jejunum to replace lower 1/4 esophagus. Pictures actual operation for same. Pre- and post-operative x-ray studies. Silent, color, 23 minutes (1957). Procurable from author.

SURGICAL TREATMENT OF HIATAL HERNIA**Brian B. Blades, Washington, D. C.**

Sound, color, 28 minutes (1954). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

SURGICAL MANAGEMENT OF THE COMPLICATIONS OF REFLUX ESOPHAGITIS**F. Henry Ellis Jr., Mayo Clinic, Rochester, Minnesota**

The film discusses the etiology of reflux esophagitis, the complications of reflux esophagitis, and the various operative procedures available for its treatment. The operation of esophagogastronomy and antral excision is shown and its rationale discussed. Sound, color, 17 minutes (1957). Procurable from Mayo Clinic, Rochester, Minnesota.

ESOPHAGEAL RECONSTRUCTION WITH COLON TRANSPLANT

Paul F. Fox and David S. Jones, Chicago, Illinois

This picture illustrates construction of the esophagus by detaching a segment of upper colon and swinging it on its vascular supply from the midcolic artery to a retrosternal position, where the upper end is anastomosed to the esophagus in the neck and the lower end to the stomach. Color, 21 minutes (1956). Procurable from Stritch School of Medicine of Loyola University, 706 South Wolcott Avenue, Chicago 12, Illinois.

***PEDUNCULATED POLYPOID LIPOMA ORIGINATING AT INTROITUS OF ESOPHAGUS AND EXTENDING TO CARDIA**

Stuart W. Harrington, Mayo Clinic, Rochester, Minnesota

Transpleural esophagotomy with complete removal of large tumor (22 cms. in length and weighing 570 gms.) that was causing dilatation of esophagus and displacing trachea. Silent, color, 17 minutes (1944). Procurable from Mayo Clinic, Rochester, Minnesota.

THE USE OF A GASTRIC TUBE TO REPLACE OR BY-PASS THE ESOPHAGUS

Henry J. Heimlich, New Rochelle, N. Y.

A tube is created from the greater curvature of the stomach and remains attached at the cardia. The spleen is resected distal to the origin of the left gastroepiploic vessels which nourish the tube. The tube is reversed and the antral end is brought cephalad and anastomosed to the pharynx or cervical esophagus. Four-fifths of the stomach remains in its normal position in the abdomen retaining its storage function. Sound, color, 30 minutes (1956). Procurable from author, 140 Lockwood Avenue, New Rochelle, N. Y.

***ESOPHAGOSCOPIC VIEWS OF LESIONS OF THE ESOPHAGUS**

Paul H. Holinger and Kenneth C. Johnston, Chicago, Illinois

Views of lesions of the esophagus are shown as they appear through the esophagoscope. Benign stenosis, both congenital and acquired, cardiospasm, post-surgical strictures of the esophagus, and benign and malignant tumors are shown without extensive case histories. Superficial and deep esophageal varices and foreign bodies are seen as they are visualized through the esophagoscope. In occasional cases the x-ray studies precede the esophagoscopy view. Silent, color, 22 minutes (1956). Procurable from The Jacques Holinger Memorial Fund, 700 North Michigan Avenue, Chicago 11, Illinois.

***FOREIGN BODIES IN THE AIR AND FOOD PASSAGES**

Paul H. Holinger and Kenneth C. Johnston, Chicago, Illinois

The endoscopic appearance of foreign bodies in the larynx, tracheobronchial tree and esophagus of a series of patients is shown. Fundamental principles of foreign body extraction are illustrated through the removal of various objects from the air and food passages of experimental animals. Silent, color, 25 minutes (1952). Procurable from The Jacques Holinger Memorial Fund, 700 North Michigan Avenue, Chicago 11, Illinois.

***TUBERCULOSIS OF THE LARYNX, BRONCHI AND ESOPHAGUS**

Paul H. Holinger and Kenneth C. Johnston, Chicago, Illinois

This film consists of endoscopic photographs of laryngeal, bronchial and esophageal tuberculosis. The laryngeal lesions include those of tuberculous infiltration, more advanced caseous, ulcerating processes, and the final scar tissue deformities associated with healing. The tuberculous lesions in the trachea and bronchi consist of the acute inflammatory stage with obstructing exudate, bronchial deformities associated with collapse therapy and various examples of bronchial stenosis. Esophagoscopy views demonstrate tuberculosis of the esophagus. Silent, color, 13 minutes (1953). Procurable from The Jacques Holinger Memorial Fund, 700 North Michigan Avenue, Chicago 11, Illinois.

***TRACHEOESOPHAGEAL FISTULA**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.

An operative film demonstrating technique of repair of congenital atresia of the esophagus in a newborn infant, including the initial anastomosis of the esophagus and the secondary gastrostomy. Sound, color, 30 minutes (1954). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

***SPONTANEOUS RUPTURE OF THE ESOPHAGUS**

S. A. Mackler, Chicago, Illinois

Demonstrates the physiologic mechanism which causes rupture of the esophagus; historical aspects; operative treatment with thoracic approach and surgical repair. Silent, color, 27 minutes (1951). Procurable from author, 1904 South Michigan Avenue, Chicago, Illinois.

TECHNIC FOR REPAIR OF SLIDING AND PARAESOPHAGEAL HIATAL HERNIA

John L. Madden, New York, N. Y.

The surgical repair of two types of esophageal hiatal hernia is shown in some detail. The first case is of the "paraesophageal" type, in which the esophagocardial junction, as seen on the roentgenogram, is below the diaphragm, and the stomach herniates up through the diaphragm alongside the esophagus. In the more common "sliding" type, which follows, the esophagocardial junction is found above the diaphragm. Sound, color, 44 minutes (1957). Procurable from Sturgis-Grant Productions, Inc., 322 East 44th Street, New York 17, N. Y.

USE OF THE TRANSVERSE COLON FOR TOTAL ESOPHAGOPLASTY

William E. Neville, Cleveland, Ohio

This film depicts a delayed reconstruction of the esophagus with the colon for a tracheoesophageal fistula with atresia. This one-year-old child had a colon transplanted through his anterior mediastinum to the esophagus in the neck and the stomach. Sound, color, 23 minutes (1955). Procurable from author, 10615 Carnegie Avenue, Cleveland 6, Ohio.

***REPAIR OF DIAPHRAGMATIC HIATUS HERNIA USING FASCIA LATA**

J. Norman O'Neill, Queen of Angels Hospital, Los Angeles, California

The transthoracic approach with a demonstration of the technique of opening the chest, isolating esophagus, dissecting of the hernial sac. A demonstration of the removal of fascia lata from the thigh, closure of the rent in the diaphragm with fascia lata, closure of the chest with drainage. Silent, color, 14 minutes (1952). Procurable from author, 1930 Wilshire Blvd., Los Angeles 57, California.

***THE SURGICAL REPAIR OF ATRESIA OF THE ESOPHAGUS WITH TRACHEO-ESOPHAGEAL FISTULA**

Willis J. Potts, William L. Riker and Arthur DeBoer, Children's Memorial Hospital, Chicago, Illinois

This film illustrates briefly the essentials of diagnosis and preoperative care of an infant with atresia of the esophagus and tracheo-esophageal fistula. The operative procedure is pictured in detail and important steps in the operation are emphasized with drawings. Special attention is centered on the importance of postoperative management and feeding. Sound, color, 23 minutes (1957). Procurable from American College of Surgeons, 40 East Erie Street, Chicago, Illinois.

***GASTROESOPHAGEAL RESECTION FOR CARCINOMA OF THE LOWER ESOPHAGUS**

Charles B. Puestow, Veterans Administration Hospital, Hines, Illinois

Motion picture of partial esophagectomy and gastroesophagostomy with emphasis on postoperative care. Silent, color, 23 minutes (1953). Procurable from Medical Illustration Department, Veterans Administration Hospital, Hines, Illinois.

***EXCISION OF EPIPHRENIC DIVERTICULUM OF THE ESOPHAGUS**

Hawley H. Seiler, St. Joseph's Hospital, Tampa, Florida

Demonstrates surgical technique involved in removal of large epiphrenic diverticulum of the esophagus. X-rays included in the film. Silent, color, 12 minutes (1956). Procurable from author, 442 West Lafayette Street, Tampa 6, Florida.

***INTRATHORACIC ESOPHAGEAL RECONSTRUCTION WITH RIGHT COLON**

Charles D. Sherman, Jr., Earle B. Mahoney, W. Andrew Dale and Samuel J. Stabins, University of Rochester Medical Center, Rochester, N. Y.

The film presents the advantages and disadvantages of other methods of esophageal reconstruction, the indications for esophageal reconstruction, and outlines by semi-animated cut-outs, esophageal reconstruction by retrosternal transplantation of the ileo-colon. Operative scenes of its use in an infant with congenital atresia follow. Sound, color, 22 minutes (1954). Procurable from Charles D. Sherman, Jr., M.D., 260 Crittenden Blvd., Rochester 20, N. Y.

***TRANSTHORACIC REPAIR OF SLIDING HIATAL HERNIA (ALLISON)**

William R. Sweetman, Veterans Administration Hospital, Portland, Oregon

This film illustrates the Allison technic for the repair of a sliding hiatal hernia, using the transthoracic and transdiaphragmatic approach. The film also contains anatomical drawings which make clear the mechanism of the development of a sliding hiatal hernia, as well as the details of repair. Preoperative and postoperative roentgenograms of the patient operated upon are included. Silent, color, 20 minutes (1953). Procurable from Central Office Film Library, Veterans Administration, Washington 25, D. C.

***ATRESIA OF THE ESOPHAGUS WITH TRACHEO-ESOPHAGEAL FISTULA**

Philip Thorek, Chicago, Illinois

Two cases are presented showing the use of the routine method of anastomosis in one patient, and the use of our own method of anastomosis over a T-tube in the other. Both patients are two-day old babies. Sound, color (1956). Procurable from author, 25 East Washington Street, Chicago 2, Illinois.

***CERVICAL DIVERTICULECTOMY (ONE STAGE OPERATION)**

Philip Thorek, Chicago, Illinois

Silent, color, 23 minutes (1948). Procurable from author, 25 East Washington Street, Chicago 2, Illinois.

RESPIRATORY SYSTEM**DIFFERENTIAL DIAGNOSIS AND TREATMENT OF LOBAR EMPHYSEMA OF INFANTS**

Osler A. Abbott, Emory University School of Medicine, Emory University, Georgia

This film includes a brief summary of symptoms and signs. Comparative films and angiocardiology, a) lobar emphysema, and b) unilateral agenesis pulmonary artery. Pulmonary findings in resection of left upper lobe with lobar emphysema. Demonstration of gross surgical pathology of resected specimen. Silent, color, 18 minutes (1957). Procurable from author.

REPARATIVE SURGERY OF THE TRACHEOBRONCHIAL TREE

Osler A. Abbott, Emory University School of Medicine, Emory University, Georgia

The film shows two aspects of repair, the first being a massive Gebauer graft replacing the lower tracheal wall, carina and medial wall left main stem bronchus for extensive carcinoma, followed by x-ray studies of other applications of such grafts. Second, an operation for polyposis of the entire trachea. Silent, color, 20 minutes (1956). Procurable from author.

***PNEUMONECTOMY FOR CARCINOMA**

William E. Adams, University of Chicago School of Medicine, Chicago, Illinois

This deals with the diagnosis, pathology and surgical technique of total pneumonectomy for primary carcinoma of the lung. The film emphasizes roentgenological diagnosis and pathological characteristics through the use of x-ray studies and special studies of the surgical specimen of five patients with this disease. The surgical technique illustrated includes the operative approach, demonstration of anatomical structures and relations, as well as the pathological lesion encountered. This film ends with Dr. Graham discussing the problem with his first patient, Dr. Gilmore. Sound, color, 35 minutes (1953). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

***COCCIDIOIDOMYCOSIS, ITS EPIDEMIOLOGIC AND CLINICAL ASPECTS**

Libero Ajello and Roger Egeberg; directed by Mr. Graham Heid; Public Health Service and Veterans Administration, Washington, D. C.

(See Anatomy, etc.)

***LOBECTOMY, RIGHT UPPER AND MIDDLE LOBES, IN THE TREATMENT OF PULMONARY TUBERCULOSIS**

Department of the Army

Demonstrates a lobectomy of the right upper and middle lobes in the treatment of pulmonary tuberculosis. Sound, color, 22 minutes (1951). (See note on page 580 concerning availability of U. S. Army films).

***PHYSIOLOGIC THERAPY IN BRONCHIAL ASTHMA**

Alvan L. Barach, Columbia-Presbyterian Medical Center, New York, N. Y.

Effects of pressure breathing, gases and aerosols on patients with severe bronchial asthma. Silent, 12 minutes (1951). Procurable from author, 622 West 168th Street, New York, N. Y.

***IMMOBILIZING LUNG CHAMBER THERAPY IN PULMONARY TUBERCULOSIS**

Alvan L. Barach, Columbia-Presbyterian Medical Center, New York, N. Y.

A combined movie illustrating physiologic therapy in bronchial asthma and physiologic and clinical aspects of the use of the immobilizing lung chamber. Silent, 14 minutes (1951). Procurable from author, 622 West 168th Street, New York, N. Y.

***RESUSCITATION FOR CARDIAC ARREST**

Claude S. Beck, University Hospitals, Cleveland, Ohio

(See Cardiovascular System).

RECONSTITUTION OF THE LUNG

John W. Bell, Veterans Administration Hospital, Sunmount, N. Y.

The technique of reconstituting the defect remaining after segmental resection in the upper lobe is illustrated in a series of operative scenes. Sound, color, 12 minutes (1954). Procurable from Veterans Administration Central Office, Visual Aids Division, Washington, D. C.

***BRONCHIOGENIC CARCINOMA**

Directed by Brian Blades, Washington, D. C. Advisory Committee: William E. Adams and Paul H. Holinger, Chicago, Illinois, John C. Jones, Los Angeles, California, and Alton Ochsner, New Orleans, Louisiana. Produced by Veterans Administration, Washington, D. C.

This film shows that patients with bronchiogenic carcinoma can be cured if diagnosis and treatment are introduced at an early stage of the disease. The incidence of bronchiogenic carcinoma, the diagnostic features and surgical management are presented. Sound, color, 16 minutes (1951). Procurable from United World Films, Inc., 1445 Park Avenue, New York, N. Y.

BRONCHOVASCULAR ANATOMY

William E. Bloomer, A. A. Liebow and M. R. Hales, New Haven, Connecticut

(See Anatomy, etc.)

***NORMAL FLUOROSCOPY OF THE CHEST**

Sponsored by the New Jersey Chapter of the American College of Chest Physicians and prepared by Paul K. Bornstein, Asbury Park, and Irving J. Selikoff, Paterson, N. J.

The great increase in the use of fluoroscopy by the general practitioner has been noted by the American College of Chest Physicians. This short film demonstrating routine fluoroscopy technique of the normal chest in various views has been prepared for teaching purposes since there had been no such film available. The film utilizes new techniques in fluorophotography, principally, for the first time, the application of the image intensifier. Silent, color, 17 minutes (1955). Procurable from American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

RIGHT TOTAL PNEUMONECTOMY FOR BRONCHIOGENIC CARCINOMA

Lyman A. Brewer, III, Los Angeles, California

Sound, color, 22 minutes (1953). Procurable from author, 1930 Wilshire Boulevard, Los Angeles 5, California.

SEGMENTAL RESECTION OF THE LUNG FOR MULTIPLE CONGENITAL ARTERIOVENOUS ANEURYSMS

O. Theron Clagett, Mayo Clinic, Rochester, Minnesota

The resection of a segment of the upper and lower lobes of the left lung of a 44-year-old man for congenital arteriovenous aneurysms is shown. A hilar dissection is carried out. Vessels leading to the segments of lung containing each aneurysm are dissected out and the segments of lung containing the aneurysms are removed by traction dissection. Silent, color, 12 minutes (1957). Procurable from author or American College of Surgeons, 40 East Erie Street, Chicago, Illinois.

THE ETIOLOGY OF POLLENOSIS**D. Eugene Cowen, Denver, Colorado**

This is a film of the primary inhalant (seasonal) flora causing hay fever and asthma; with the exception of the so-called "dust" factor, which is so controversial with many men. Color, 19 minutes (1953). Procurable from author, 1612 Fremont Place, Denver, Colorado.

DEGENERATIVE LUNG DISEASE*Gerald L. Crenshaw, Oakland, California**

This film deals with the patho-physiological state in which the lung vanishes into large air spaces; prior to this, there is a loss of all vascularity so that when the lung is cut at the operating table, while still attached to its blood and air supply, there is no bleeding. It also shows the structural damage to the bronchi. Sound, 20 minutes (1955). Procurable from author, 447 Twenty-ninth Street, Oakland 9, California.

ALLERGY: IMMUNOLOGY, DIAGNOSIS AND TREATMENT*Leo H. Crip, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania**

Part one discusses the essential mechanism of allergy including types of anaphylactic and atopic allergies, production and fixation of antibodies and the antigen-antibody reaction, roles of histamine in allergic phenomenon and the function of antihistamines. Part two concerns itself with clinical allergy including illustrative case histories and treatment procedures. Sound, color, 45 minutes (1951). Procurable from Nepera Laboratories Division, Yonkers 2, New York.

GLOSSOPHARYNGEAL BREATHING*C. W. Dail and J. Affeldt, Rancho Los Amigos Respiratory Center for Polio, Hondo, California**

This film demonstrates the advantages and the technique of glossopharyngeal breathing for patients with severe respiratory muscle paralysis. Sound, color, 20 minutes (1954). Procurable from National Foundation for Infantile Paralysis, 120 Broadway, New York, N. Y.

MECHANICAL FACTORS GOVERNING EXPIRATORY OBSTRUCTION TO AIRFLOW*Howard G. Dayman, Chronic Disease Research Institute, University of Buffalo School of Medicine, Buffalo, N. Y.**

(See Anatomy, etc.)

POWER OF POSITIVE PRESSURE*Howard G. Dayman and William Loeser, National Foundation for Infantile Paralysis, Buffalo, N. Y.**

Demonstrates the simplicity and effectiveness of positive pressure respiratory aids in patients with chronic respiratory paralysis, for example, can permit ambulant program. Type of pumps include fireplace bellows, Dayman Cough Caddy. Sound, color, 14 minutes (1956). Procurable from Howard G. Dayman, M.D., 993 Delaware Avenue, Buffalo 9, N. Y.

NEW DEVELOPMENTS IN BRONCHOSCOPIC PHOTOGRAPHY AND CINEMATOGRAPHY, INCLUDING ADAPTATION FOR TELEVISION*J. M. Dubois de Montreynaud and R. J. Edwards, Regional Center Against Cancer, Reims, Marne, France.**

Demonstration of the equipment (a new French bronchoscope of Fourestier, Gladu and Vulmiere) and demonstration of bronchoscopy with this apparatus. Demonstration of television and experimentation in animals. Views in color of normal bronchi, tuberculous fistules, malignant tumors and asthma. Bronchoscopic views in children. Sound, color, 25 minutes (1957). Procurable from J. M. Dubois de Montreynaud, M.D., 4 rue du General Baratier, Reims, Marne, France.

NEW TECHNIC OF BRONCHOSCOPY*J. M. Dubois de Montreynaud, R. J. Edwards and A. J. Gladu, Regional Center Against Cancer, Reims, Marne, France**

1) The technic of bronchoscopy with details of equipment, diagrams of the apparatus and of the bronchial tree. 2) Tuberculosis—several cases of active fistules and healed fistules. 3) Cancers with x-ray and histology. 4) Asthma—experimental observations on animals and clinical observations on patients. Silent (French-English titles), color, 37 minutes (1956). Procurable from J. M. Dubois de Montreynaud, M.D., 4 rue du General Baratier, Reims, Marne, France.

SEGMENTAL RESECTION OF AN ARTERIOVENOUS FISTULA OF THE LUNG**J. L. Ehrenhaft and Montague S. Lawrence, State University of Iowa Hospitals, Iowa City, Iowa**

This film was made during resection of pulmonary arteriovenous fistula located in the superior segment of the right lower lobe of the lung. Preoperative chest roentgenograms, intravenous angiogram and oxygen saturation studies are presented. The arteriovenous pulsations of the fistula are demonstrated prior to segmental resection of the lesion. A vinyl plastic injection corrosion cast of the vascular anomaly is also shown. Silent, color, 12 minutes (1958). Procurable from author.

RADICAL PNEUMONECTOMY WITH INTRAPERICARDIAL DISSECTION*F. Henry Ellis, Jr., Mayo Clinic, Rochester, Minnesota**

The film portrays the technique used in carrying out intrapericardial dissection at the time of pneumonectomy for carcinoma of the lung. A typical case is discussed and diagrams of the operative procedure are employed. Silent, color, 18 minutes (1955). Procurable from Mayo Clinic, Rochester, Minnesota.

RADICAL PNEUMONECTOMY FOR CARCINOMA*Carmelo Gil-Turner, Grupo Sanatorial de Santa Marina, Bilbao, Spain.**

This film gathers the technique of radical pneumonectomy for cancer with ligatures within the pericardium and extirpation of all the mediastinal adenopathies in an aged patient. Silent, color, 30 minutes (1955). Procurable from author, Clinica F. San Sebastian, Rafaela de Ybarra 25, Deusto-Bilbao, Spain.

***THE PHYSIOLOGY OF INFANT RESUSCITATION**

Roy F. Goddard, Lovelace Clinic, Albuquerque, New Mexico

The mechanical and physical forces influencing neonatal respiration are portrayed in investigative studies of pressure-time relationships and mechanics of breathing studies in the newborn. Intermittent positive pressure resuscitation given with the GBL Infant Hand Resuscitator is demonstrated in the delivery room and the newborn nursery. Sound, color, 15 minutes (1957). Procurable from Lovelace Foundation for Medical Education and Research, 4800 Gibson Blvd., SE, Albuquerque, New Mexico.

***TREATMENT OF RESPIRATORY CONDITIONS IN CHILDREN**

Roy F. Goddard, Lovelace Clinic, Albuquerque, New Mexico

The treatment of respiratory conditions in children is portrayed by the investigative work-up of a ten year old girl with asthma and her subsequent treatment with intermittent positive pressure-aerosol therapy. Routine laboratory studies combined with respiratory ventilation studies show her improvement over a period of six months therapy. Sound, color, 13 minutes (1955). Procurable from Lovelace Foundation for Medical Education and Research, 4800 Gibson Blvd., SE, Albuquerque, New Mexico.

PULMONARY RESECTION FOR BRONCHIAL ADENOMA

Alfred Goldman, Beverly Hills, California

Depicts surgery, bronchoscopic, pathology, pre- and post-operative treatment. Silent, color, 24 minutes (1948). Procurable from author, 416 North Bedford Drive, Beverly Hills, California.

EXTRAFASCIAL LUCITE PLOMBAGE FOR PULMONARY TUBERCULOSIS

Alfred Goldman, Beverly Hills, California

Illustrates surgical technic with narration outlining value of this operation in treatment of pulmonary tuberculosis. Sound, color, 24 minutes (1949). Procurable from author, 416 North Bedford Drive, Beverly Hills, California.

***PNEUMONECTOMY FOR BRONCHIECTASIS**

Evarts A. Graham, St. Louis, Missouri

This pneumonectomy was performed on a seven year old boy who had universal bronchiectasis of the left lung, dating back for a period of about five years. The surgical plan for this procedure is clearly illustrated and the narration covers the rationale step by step, along with certain precautions that need to be taken. Post-operative x-ray and pictures of the patient are included, six weeks after the procedure. Sound, color, 10 minutes (1950). Procurable from American Cynamid Company, Surgical Products Division, Danbury, Connecticut.

***ECHINOCOCCUS CYST OF THE LUNG; PATHOLOGY AND OPERATIVE REMOVAL**

Elliott Harrison, Vancouver, B. C., Canada

Short outline of pathology and epidemiology followed by the operative removal of echinococcus cyst. Silent, color, 10 minutes (1955). Procurable from St. Paul's Hospital, Burrard Street, Vancouver, B. C., Canada.

***ANTI-TUBERCULOSIS DRUGS IN THE MEDICAL AND SURGICAL TREATMENT OF TUBERCULOSIS**

H. Corwin Hinshaw and Albert C. Daniels, San Francisco, California

(See Anatomy, etc.)

***A BRONCHOSCOPIC CLINIC IN KODACHROME**

Paul H. Holinger, Kenneth C. Johnston and Frank J. Novak III, Chicago, Illinois

This film presents the histories, x-rays, bronchoscopic findings and, where biopsies were taken, the histology, of ten patients with bronchopulmonary disease. The operating room and instrumentarium as well as the techniques of anesthesia, of the bronchoscopic examination itself and of the bronchoscopic photography are shown. Silent, color, 30 minutes (1949). Procurable from The Jacques Holinger Memorial Fund, 700 North Michigan Avenue, Chicago 11, Illinois, and the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

***THE ENDOSCOPIC APPEARANCE OF DISEASES OF THE TRACHEA**

Paul H. Holinger and Kenneth C. Johnston, Chicago, Illinois

This film shows congenital stenosis, inflammatory processes and benign and malignant tumors of the trachea as they appear through the tracheoscope and bronchoscope. Silent, color, 20 minutes (1951). Procurable from The Jacques Holinger Memorial Fund, 700 North Michigan Avenue, Chicago 11, Illinois.

***FOREIGN BODIES IN THE AIR AND FOOD PASSAGES**

Paul H. Holinger and Kenneth C. Johnston, Chicago, Illinois

(See Esophagus.)

***THE PHYSIOLOGY AND PATHOLOGY OF BRONCHIAL OBSTRUCTION**

Paul H. Holinger and Kenneth C. Johnston, Chicago, Illinois

The mechanics of the three stages of bronchial obstruction are demonstrated in this film through the utilization of cinebronchoscopy. The bronchoscopic appearance of bronchial motility responsible for the various degrees of obstruction is shown. Foreign bodies, inflammation and neoplastic disease constitute the obstructing lesions within the bronchi. The roentgen and endoscopic aspects of the problem are correlated throughout the film. Silent, color, 20 minutes (1956). Procurable from The Jacques Holinger Memorial Fund, 700 North Michigan Avenue, Chicago 11, Illinois.

***TUBERCULOSIS OF THE LARYNX, BRONCHI AND ESOPHAGUS**

Paul H. Holinger and Kenneth C. Johnston, Chicago, Illinois

(See Esophagus.)

***TRACHEOESOPHAGEAL FISTULA**

George H. Humphreys II, Columbia-Presbyterian Medical Center, New York, N. Y.

(See Esophagus.)

***THE BRONCHOPULMONARY SEGMENTS**

Chevalier L. Jackson, John F. Huber and Charles M. Norris, Temple University School of Medicine and Hospital, Philadelphia, Pennsylvania
(See Anatomy, etc.)

***PERIPHERAL CIRCUMSCRIBED PULMONARY LESION**

Harold A. Kipp, Mercy Hospital, Pittsburgh, Pennsylvania

Surgical treatment of circumscribed pulmonary lesion. Silent, color, 7 minutes (1955). Procurable from author.

***RADICAL SURGERY FOR ADVANCED LUNG CANCER**

Adrian Lambert, New York, N. Y.

A film depicting the surgical techniques in the radical approach to advanced lung cancer is shown to demonstrate the correct surgical handling of the chest wall and mediastinum for advanced malignant disease. Sound, color, 33 minutes (1954). Procurable from Sturgis-Grant Productions, Inc., 322 East 44th Street, New York 17, N. Y.

***TUBERCULOSIS OF THE LARYNX**

William A. Lell, Graduate School of Medicine, University of Pennsylvania, Pittsburgh, Pennsylvania

The first part of this film shows various types of laryngeal involvement by tuberculous infection, ranging from minimal inflammatory changes to actual destruction of some of the laryngeal structures. The second part deals with a series of cases showing response to streptomycin therapy. Silent, color, 25 minutes (1945). Procurable from author, 353 South 18th Street, Philadelphia 3, Pennsylvania.

UPPER PARTIAL THORACECTOMY WITH PNEUMOLYSIS (A New Procedure in Surgical Collapse Therapy)

Felipe Margarit, Barcelona, Spain

Operative technic showing resection of 5, 6 and 3 ribs; extrapleural pneumolysis through the 3rd periosteal bed; resection *without periosteal peeling* of the 2nd and 1st ribs; mediastinal pneumolysis and suture of the intercostal bundles on the apex lung. Silent, color, 15 minutes (1954). Procurable from author, Calle Balmes 105, Barcelona, Spain.

***PRINCIPLES OF RESPIRATORY MECHANICS**

Jere Mead, E. P. Radford Jr., M. B. McIlroy, B. G. Ferris Jr., and J. L. Whittenberger, Department of Physiology, Harvard Medical School, Boston, Massachusetts
(See Anatomy, etc.)

***BCG VACCINATION AGAINST TUBERCULOSIS**

National Tuberculosis Association, New York, N. Y., and Research Foundation, Chicago, Illinois

(See Anatomy, etc.)

SEGMENTAL PULMONARY RESECTION

M. M. Newman, W. F. Lee Jr., and G. A. Coors, U. S. Naval Hospital, St. Albans, New York

Preoperative x-rays, technic of resection of apical posterior segmental resection, right and left, and superior segmental resection left. Gross pathology, postoperative x-rays. The cases are tuberculous. Sound, color, 35 minutes (1955). Procurable from U. S. Naval Hospital, Chief of Surgery, St. Albans, New York.

***TREATMENT OF THORACIC INJURIES**

Rudolph J. Noer, Louisville, Kentucky

Relates the various types of thoracic injuries to the disturbances in pulmonary function which they produce, and demonstrates the principles to be followed in maintaining and/or restoring adequate pulmonary ventilation. Sound, color, 31 minutes (1954). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

***RECORDING OXIMETERS AND THEIR APPLICATIONS**

John F. Perkins, Jr. and William E. Adams, University of Chicago School of Medicine, Chicago, Illinois

(See Respiratory System.)

***LOBECTOMY FOR HYDATID CYSTS OF THE LUNGS**

Walter L. Phillips, Cape Town, South Africa

(18 minutes, 1949). Procurable from author, Highwick Drive, Kenilworth, Cape Town, South Africa

***POSTOPERATIVE AEROSOL THERAPY**

Max S. Sadove and Ruben C. Balagot, University of Chicago School of Medicine, Chicago, Illinois

Deplets briefly normal and abnormal physiology of respiratory tract, causes of atelectasis, various types of aerosol treatments in postoperative patients and demonstrates the most common types of apparatus and therapeutic agents employed. Sound, color, 25 minutes (1955). Procurable from Winthrop-Stearns, Inc., 1450 Broadway, New York 18, N. Y.

***ARTIFICIAL RESPIRATION VIA THE TRACHEOTOMY TUBE**

George A. Saxton, Jr., Gareth Gish and Garland Johnson, University of Illinois College of Medicine, Chicago, Illinois

Presentation of various methods of adapting American respiratory equipment to give intermittent positive pressure breathing (IPPB) through an uncuffed tracheotomy tube. Silent, color, 23 minutes (1956). Procurable from George A. Saxton, Jr., M.D., 840 South Wood Street, Chicago 12, Illinois.

REPAIR OF HERNIA OF THE LUNG

L. M. Shefts, San Antonio, Texas

The diagnosis of pulmonary hernia, including roentgenographic findings, is demonstrated. The repairs as shown require dissection and closure of the sac and utilization of periosteal flaps from the ribs above and below the defects. Utilization of wire mesh is also demonstrated. Silent, color, 20 minutes (1952). Procurable from author, 510 Moore Bldg., San Antonio 5, Texas.

PULMONARY DECORTICATION

L. M. Shefts, San Antonio, Texas

The indications for technique and results of pulmonary decortication are demonstrated in cases of unexpandable lungs in tuberculous patients, as follows: Decortication of a tuberculous empyema of six years duration, decortication of a secondarily infected tuberculous empyema of three years duration with contralateral thoracoplasty, and pulmonary decortication followed by contralateral decortication and removal of oleothorax and lower lobe lobectomy. Specimens are shown removed intact as a sac. Silent, color, 35 minutes (1952). Procurable from author, 510 Moore Bldg., San Antonio 5, Texas.

***THE RECOGNITION AND MANAGEMENT OF RESPIRATORY ACIDOSIS**

Reginald H. Smart, Hurley L. Motley and Joseph F. Boyle, University of Southern California School of Medicine, Los Angeles, California
(See Anatomy, etc.)

***SPONTANEOUS AND ARTIFICIAL COUGHING PROCEDURES WITH A NEW APPARATUS**

Juergen Stoffregen, University Surgical Clinic, Heidelberg, Germany

Spontaneous coughing in a human being after bronchography. Cinematogram of artificially induced coughing in a dog under Pentothal-Na-anesthesia and complete curarization after filling the bronchial tree with different contrast media (Dionosil, Jodipin). Silent, 5 minutes (1956). Procurable from author.

SEGMENTAL PULMONARY RESECTION

John V. Thompson, Methodist Hospital, Indianapolis, Indiana

Film depicts the technique of segmental pulmonary resection and the anatomy in detail. Sound, color, 10 minutes (1954). Procurable from author, 7899 Ridge Road, Indianapolis, Indiana.

***DECORTICATION OF THE UNEXPANDABLE PNEUMOTHORAX LUNG**

David H. Waterman, Knoxville, Tennessee

Illustrates technique of operation plus case management. Silent, color, 23 minutes (1950). Procurable from author, 1918 West Clinch Street, Knoxville, Tennessee.

EXTRAPERIOSTEAL LUCITE BALL PLOMBAGE

Francis M. Woods, Overholt Thoracic Clinic, Boston, Massachusetts

The physiological principles which lead to paradoxical motion of the lungs and mediastinum are shown. Their application to thoracoplasty is demonstrated and the use of extraperiosteal plombage to prevent paradoxical motion and make possible a one-stage thoracoplasty is shown. The indications for this procedure are also discussed. Silent, color, 22 minutes (1953). Procurable from author, 125 Francis Street, Boston 15, Massachusetts.

HOSPITAL PERSONNEL***OCCUPATIONAL THERAPY IN TUBERCULOSIS**

Department of the Army

Produced by the U. S. Army in 1949, sound, 27 minutes. (See note on page 580 concerning availability of U. S. Army films.)

***RESUSCITATION FOR CARDIAC ARREST**

Claude S. Beck, University Hospitals, Cleveland, Ohio

(See Cardiovascular System.)

***CARDIAC ARREST: IT'S PREVENTION, RECOGNITION AND TREATMENT**

Egbert H. Fell and Lowell Peterson, Chicago, Illinois

(See Cardiovascular System.)

***RIGHT HEART CATHETERIZATION**

Mr. James Reske and Paul S. Mahoney, University of California School of Medicine, Los Angeles, California

(See Cardiovascular System.)

***CARDIAC ARREST**

Henry Swan and J. Cuthbert Owens, Denver, Colorado

(See Cardiovascular System.)

LAITY

***THE AIR WE BREATHE**

Mine Safety Appliances Company, Pittsburgh, Pennsylvania

The film is professionally produced, covering the whole field of respirator protection for the worker against dusts, gases and other air contaminants. Sound, 26 minutes (1954). Procurable from Mine Safety Appliances Company, Pittsburgh 8, Pennsylvania.

***ARE YOU POSITIVE?**

National Tuberculosis Association, New York, N. Y.

An entertaining film in animation and color dealing with prevalent superstitions as well as common misconceptions about tuberculosis. Sound, color, 12½ minutes (1957). Procurable from the National Tuberculosis Association, 1790 Broadway, New York, N. Y.

***YOU CAN LICK TB**

Veterans Administration, Washington, D. C.

Tells the story of a typical tuberculous patient in a Veterans Administration Hospital. Stresses the importance of rest, readjustment to a less strenuous life, taking interest in the Veterans Administration rehabilitation program in order to become fitted for work within one's physical capacities. Sound, 20 minutes (1950). Procurable from Visual Aids Division, Veterans Administration, Washington 25, D. C.

MISCELLANEOUS

TRAUMATIC HERNIA OF THE DIAPHRAGM

William E. Adams, John Todd Reynolds and Peter V. Moulder, University of Chicago and University of Illinois, Chicago, Illinois

This film concerns itself especially with the early diagnosis and effective surgical management of traumatic hernia of the diaphragm. A running narration discusses the pertinent clinical features which are usually attendant in these cases and stresses the life saving importance of early attention and effective management. X-ray demonstrations are freely used and are combined with pathologic material as well as autopsy specimens to emphasize the above point. Finally, the operative repair of an unusual hernia which projected through the anterolateral aspect of the left diaphragm and out through the left chest wall to lie beneath the skin over that area is demonstrated. The surgical principles involved in the management of traumatic hernias of the diaphragm are discussed and illustrated in the operative repair of the above case. Emphasis is placed on the frequency of these important lesions and a means of lowering morbidity and mortality when early clinical and roentgenologic features are observed and the possibility of their presence is kept in mind. Sound, color, 21 minutes (1957). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

MEDIASTINAL TUMORS

Brian Blades, Washington, D. C.

Sound, color, 39 minutes (1952). Procurable from American College of Surgeons, 40 East Erie Street, Chicago 11, Illinois.

***NORMAL FLUOROSCOPY OF THE CHEST**

Sponsored by the New Jersey Chapter of the American College of Chest Physicians and prepared by Paul K. Bornstein, Asbury Park, and Irving J. Selikoff, Paterson, N. J.

(See Respiratory System.)

***MEDIASTINAL EXPLORATION FOR PARATHYROID ADENOMA**

O. Theron Clagett, Mayo Clinic, Rochester, Minnesota

This motion picture illustrates the removal of a parathyroid adenoma from the mediastinum of a patient with hyperparathyroidism. The adenoma was located deep in the mediastinum under the arch of the aorta and adjacent to the pulmonary artery. Silent, color, 8 minutes (1955). Procurable from author.

THE SURGICAL CORRECTION OF PECTUS EXCAVATUM

Rollin A. Daniel, Jr., Vanderbilt University School of Medicine, Nashville, Tennessee

The film depicts steps in operation for funnel chest deformity which is a modification of procedure advocated by Doctor Ravitch. Color, 9 minutes (1956). Procurable from author, 1211-21st Ave., S., Nashville, Tennessee

***TUMORS OF THE MEDIASTINUM**

Carmelo Gil-Turner, Grupo Sanatorial de Santa Marina, Bilbao, Spain

This film shows the resection in all its stages, of a cystic tumor of the mediastinum and the value of the fluoroscopic exploration, since the patient was operated upon when he still presented no symptoms. Silent, color, 15 minutes (1955). Procurable from author, Clinica F. San Sebastian, Rafaela de Ybarra 25, Deusto-Bilbao, Spain.

***THYMECTOMY FOR MYASTHENIA GRAVIS**

Alfred Goldman, Beverly Hills, California

Illustrates the cases of myasthenia gravis with tumor of the thymus and surgical technique for thymectomy. Silent, color, 32 minutes (1950). Procurable from author, 416 North Bedford Drive, Beverly Hills, California.

***EXAMINATION OF THE BREAST**

Dudley Jackson, Sr., A. Todd and F. W. Steinberg, Nix Tumor Clinic, San Antonio, Texas

Shows fifteen steps necessary for a breast examination, including technique of expressing breast secretions for early diagnosis of papilloma and intra-mammary pathology. Sound, color, 27 minutes (1954). Procurable from Nix Tumor Clinic, 1525 Nix Professional Bldg., San Antonio, Texas.

***THORACO-ABDOMINAL NEPHRECTOMY**

Robert M. Janes and Charles J. Robson, Toronto, Canada

This film demonstrates the removal of kidney tumors through the abdominothoracic approach. The excellent exposure obtained reduces trauma to the growth, permits early occlusion of the vascular pedicle, and allows complete removal of the neoplasm with the adjacent tissue and lymph nodes. Sound, color, 26 minutes (1955). Procurable from American Cyanamid Company, Surgical Products Division, Danbury, Connecticut.

***CHONDROSARCOMA—LEFT COSTAL MARGIN**

Frederick E. Kredel and Milton Weinberg, Medical College of South Carolina, Charleston, S. C.

Excision of tumor with lower chest wall and upper abdominal wall. Diaphragm sutured to top of defect. Giant pedicle flap and skin graft for closure. Silent, color, 12 minutes (1954). Procurable from Medical College of South Carolina, Charleston 16, S. C.

***ARE YOU POSITIVE?**

National Tuberculosis Association, New York, N. Y.

(See Laity.)

***TREATMENT OF THORACIC INJURIES**

Rudolph J. Noer, Louisville, Kentucky

(See Respiratory System.)

***THE HEART CRIPPLER**

David S. Ruhe, University of Kansas School of Medicine, Kansas City, Kansas

Kinescope of a TV program on rheumatic fever presented as a part of the series "Highroads to Health," by the University of Kansas. Includes convalescent care and prophylaxis. Narrator: Geoffrey Martin, M.D., Director of Maternal and Child Health, Kansas State Department of Health. Sound, 19 minutes (1957). Procurable from University of Kansas School of Medicine, Kansas City, Kansas.

***EXCISION OF MEDIASTINAL TERATOMA**

Hawley H. Seiler, Tampa, Florida

Demonstrates surgical technique involved in removal of extremely large mediastinal teratoma. X-rays and patient also shown on film. Silent, color, 9 minutes (1954). Procurable from author, 442 West Lafayette Street, Tampa 6, Florida.

***THORACO—CERVICAL SURGICAL APPROACH TO CARCINOMA OF THE THYROID**

Allan Stranahan, John C. McClintock, Ralph D. Alley and Harvey W. Kausel, Albany Hospital and Medical College, Albany, N. Y.

Rationale and demonstration of combined trans-sternal mediastinal and neck dissection with thyroidectomy for carcinoma of the thyroid. Sound, color, 16 minutes (1957). Procurable from Allan Stranahan, M.D., Albany Medical College, Albany, N. Y.

UNITED STATES ARMY MEDICAL MOTION PICTURE FILMS

Send requests to Commanding General, Attention: Surgeon, of the Army Area in which the requesting institution or individual is located:

First U. S. Army, Governors Island, New York

Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont

Second U. S. Army, Fort George G. Meade, Maryland

Delaware, Kentucky, Maryland, Ohio, Pennsylvania, Virginia and West Virginia

Third U. S. Army, Atlanta 3, Georgia

Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee

Fourth U. S. Army, Fort Sam Houston, Texas

Arkansas, Louisiana, New Mexico, Oklahoma, and Texas

Fifth U. S. Army, 1660 East Hyde Park Boulevard, Chicago, Illinois

Colorado, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Iowa, Wisconsin, South Dakota and Wyoming

Sixth U. S. Army, Presidio of San Francisco, California

Arizona, California, Idaho, Montana, Nevada, Oregon, Utah and Washington

MEDICAL SERVICE BUREAU POSITIONS WANTED

Foreign graduate, Chinese extraction, 42, married, children, F.C.C.P., permanent resident in U. S., fair knowledge of English and administrative skill, not eligible for state licensure, seeks position of staff physician at state tuberculosis institution, tuberculosis unit of mental institution, or assistantship for administration (institutional or state) or house physician at busy custodial institution. Available after July 1. Please address inquiries to Box 299B, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

F.C.C.P., 47, married, desires to relocate. 3 years accredited residency in chest diseases and chest surgery, 15 years private practice. Considerable administrative and industrial experience. Very extensive experience in bronchosophagology and other diagnostic techniques. Licensed in California. Seeking position in active chest disease department or tuberculosis control program. Please send inquiries to Box 300B, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

POSITIONS AVAILABLE

Two physicians wanted for approved residency in tuberculosis and pulmonary diseases. 200-bed hospital, integral part of medical school and of primary general teaching hospital. Residency includes 3 months elective training in related fields such as cardiopulmonary laboratory, research bacteriology laboratory, infectious diseases. Salary \$225 month minimum. Please write to: Medical Director, Woodlawn Hospital, 3819 Maple Avenue, Dallas, Texas.

Physician interested in pulmonary diseases wanted for 170-bed state supported tuberculosis hospital established 2 years. Active surgical program, outpatient service, x-ray and laboratory. Consultants in all branches. U. S. citizenship and Alabama medical license or eligibility required. Salary \$8500-\$9500 depending on qualifications. Quarters to be made available. Apply: Medical Director, Sixth District Tuberculosis Hospital, 800 St. Anthony Street, Mobile, Alabama.

Recruitment of physicians, full-time, TB-NP Service, Los Angeles area. Hospital is affiliated with 3 medical schools. Salary \$8990 thru \$11,395 plus 25 percent specialty allowance. Contact Manager, VA Hospital, Sepulveda, California.

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